

DEPARTMENT OF FISHERIES

MADRAS



A HANDBOOK ON DEEP SEA FISHING IN MADRAS STATE

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P R E F A C E .

With the advent of mechanised fishing and location, of new fishing grounds in the inshore and offshore waters deep sea fishing has become an important aspect of development of the marine fisheries resources of this State. To facilitate deep sea fishing and to serve as a guide to those engaged in it, this handbook is brought out by the Fisheries Department. This handbook describes not only indigenous crafts and gear but also modern fishing methods such as purse seining, trawling, trolling, long lining and gill netting. Advantages of fishing nets made of synthetic fibres, preservation of gear and of detection of fish shoals are enumerated in the book. A useful chapter on marine engines and their maintenance with practical suggestions is also included. This handbook will thus prove beneficial to all those concerned with the marine fishing industry of this State.

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A Handbook on Deep Sea Fishing in Madras State

BY P. I. CHACKO, G. K. KURIYAN and A. T. SHERIFF.

I. INTRODUCTION.

The Madras State has a coastline of 620 miles, and the sea off it is rich in fisheries. The fishermen conduct fishing operations with indigenous and non-mechanized crafts and tackles and thus exploit the sea in a very small scale and that too mostly in the inshore regions only. During recent years, the Fisheries Department has been carrying on experiments in deep sea fishing, mechanisation of indigenous crafts, designing of new types of boats and introduction of modern types of nets. These have given encouraging results. Several new fishing grounds have been located, and the fisherfolk are satisfied with the utility of mechanised fishing. They are being encouraged by providing a new type of mechanised boats called 'Pablo' boats and nylon nets at subsidised rates. It is expected that mechanized fishing and exploitation of the fishing grounds in the deeper waters will be developed within few years. And therefore, this handbook is published to serve as a guide to those who are interested in deep sea fishing operations.

II. FISHERIES OF THE MADRAS COAST.

The fisheries of the coastal waters of the State vary at the different centres due to biological, hydrographical and weather conditions. The observations made during the last several years have enabled the Department to prepare a fisheries calendar for the important fishing centres. The fisheries that can be expected normally in each month at the different centres are shown in the appended table.

III. INDIGENOUS CRAFTS AND GEAR.

The crafts and gear employed by the fishermen are all indigenous and are briefly described below :—

The sea is rough and the surf breaks heavily upon the coast. And therefore, the craft used are chiefly the non-rigid catamarans and Masula boats. The catamaran is the most prominent craft. It is a keelless raft formed by lashing together several logs, which are cut square on one edge and curved into a rough cone at the other. The Masula boat is much employed for fishing with inshore drag nets. This is constructed with planks, without ribs or frames, so as to stand the severe knocking of the surfs.

The planks are sewn together with coir rope. Besides these two main types of craft, a few other types, suitable for particular regional waters are also used on the east coast. The Tuticorin type of boat is carvel built and is used at Tuticorin and Pinnakayal. Dhonies with outriggers and balance-boards are common in the Palk Bay and Kilakarai areas.

The tackle that are employed by the east coast fishermen are of the following types.

I. FIXED OR STATIONARY NET.

(i) *Kalamkattuvalai*.—Set over mud flats in the northern sector of the Gulf of Mannar for entrapping of fishes brought by the high tide. The common fishes captured are mullets, sillago, chanos, Lates and miscellaneous perches.

(ii) *Kalavalai*.—Commonly used in the shallow lagoons in the Palk Bay region of Tanjore district. Fishes like mullets, Lates, Polynemus and sharks which move against the current during the high tide are gilled.

II. CAST NET.

(iii) *Visuruvalai (veechuvalai)*.—Operated from a catamaran or boat in shallow waters up to 2 fathoms for capturing miscellaneous fishes.

III. SEINE NET.

(iv) *Vanguvalai*. A small seine-type net plied by 2 men in shallow lagoons for catching prawns which are utilised by the line fishermen.

IV. BAG NETS AND BOAT-SEINES.

(v) *Thurivalai (vellaivalai)*.—A primitive trawl net operated from two catamarans in waters 4—6 fathoms deep of the Coromandel area. Demersal (bottom) fishes like cat-fishes, rays and soles are caught.

(vi) *Madivalai*.—This is also a primitive trawl net used in the Gulf of Mannar and Palk Bay during the north-east monsoon. Two catamarans each with one end of the net, sail on a parallel course keeping the mouth of the net open, and close up when the net is to be hauled. Pelagic and sub-surface fishes like sardines and silverbellies are captured.

(vii) *Madavalai (Maravalai, Eddavalai, Nidavalai, Kambivalai)*.—This net is a shallow bag with a wide rec-

tangular mouth. It is used in conjunction with lures, called kambi, consisting of strings of cocoanut leaves attached to a rope and moored in the sea at the commencement of the fishing season. The net is operated along the Coromandel coast in 6-8 fathoms and miscellaneous pelagic fishes, particularly pomfrets, sardines and mackerels are caught.

(viii) *Paindivalai*.—This is similar to the previous one but slightly smaller and is operated in shallower waters upto 4 fathoms for capturing sardines.

(ix) *Kolavalai*.—This bag net has long wings and is operated as in the previous cases in deeper waters of 6-12 fathoms. Pelagic shoaling fishes and particularly gar fishes and halfbeaks are caught in large numbers.

V. INSHORE DRAG NETS.

(x) *Periavalai (Karavalai)*. This is a large hemp net about 50 feet long and 35-45 feet broad, with long wings 700 feet in length. The net is shot near the surf-beaten shore from a padagu in about 1-2 fathoms and by rowing round in a circle a shoal is trapped. The net is then dragged towards the shore. Shoaling fishes like mackerels, ribbon fish, silver-bar and prawns are hauled up.

VI. DRIFT AND GILL NETS.

(xi) *Valavalai*.—This is extensively used in deeper waters upto 14 fathoms in the Gulf of Mannar far capturing silver bar fish and in the Coromandel coast for pomfrets, seer, Lates, Polynemus, etc. It is 150 - 200 feet long and is provided with floats and sinkers. The craft with the tackle is allowed to drift and dark nights are chosen so that the fish might not easily see the obstacle in their path.

(xii) *Kannivalai*. This drift net is longer (about 250 feet) but is operated in shallower waters upto 4 fathoms in the same pattern as before. Sardines are the chief catch.

(xiii) *Thirukkaivalai*. This is 120 feet in length with larger mesh of about 5 inches and is operated in 7-10 fathoms for catching skates, rays and saw fishes.

(xiv) *Kolavalai*. This is a small drift net used in the Tuticorin area but operated in 7-10 fathoms. The main catches are sardines and anchovies.

(xv) *Pachuvalai*. This is another small-type drift net of the Tuticorin area. It is operated in 7-8 fathoms for catching mostly sharks, rays and cat fish.

VII-LURES.

(xvi) *Kambi and Kacha*.—This tackle is used for catching flying fishes in the off-shore waters upto 25 fathoms. Three bundles of leaves of screwpine or neem or leguminous shrubs tied to ropes 50-60 fathom long constitute the kambi. With these the flying fishes which congregate for spawning purpose are lured and then dipped out with two rectangular dip-nets (kacha).

VIII-TROLL OR WHIFF.

(xvii) *Odukayuru*. This is important type of fishing done at Tuticorin area when the wind is favourable for the boats to sail at a good speed. About 10 lines each 50 fathoms long are trailed from a boat. The fishes caught are leather jackets, horse-mackerels, seer, barracuda and tunny.

IX-LINES.

(xviii) *Hand-line (Kittakayuru)*. Handling is more commonly practised in the Gulf of Mannar upto 45 fathoms. Each line is 70-100 fathoms in length and has four hooks. Baits are sardines and prawns and the main catches are rock-cods, perches, breams, snappers and horse-mackerels.

(xix) *Long line (Parappu Kayuru thoondi or airamkal thoondi)*. Each line has 500-1000 hooks attached to snoods at one fathom intervals. The long lines are operated in 7-10 fathoms and each boat carry a crew of 5 men. Baits are sardines, prawns and other small fishes and the catches are sharks, rays and cat fish.

IV. MODERN FISHING METHODS.

With the use of mechanised boats, the range of operations of many of the above indigenous gears, especially if made of nylon can be extended considerably. But larger vessels and modern types of gear can be used not only to obtain better catches but also to exploit the bottom fisheries. Methods like purse seining, trawling, trolling, long-lining, and gill netting are described below:—

(i) PURSE-SEINING.

A purse seine is a net made like a long shallow curtain. Its upper edge is buoyed by a cork line; the

lower edge is weighted with sinkers strung on the lead line. Along the entire length of the lead line a number of rings are fastened on regular intervals with short ropes called "bridle lines".

Through these rings, runs the purse line, purse rope or purse string by means of which the bottom of the net is closed. At each end of the net are the "up and down lines" between the cork and lead lines. Alone each of the up and down lines is a series of small rings through which runs the brail rope. The brail rope or brail line is used to lift up the lead line to the cork line, one end of it being fastened to the lead line, the other end to the cork line. One end of the net (called skiff end) is tied to the skiff with a heavy line about 12 fms. long. The other end (called haul end) is fastened to the seine boat with a line about 100 fms. long. Purse seines used for Tuna are about 275 to 350 fms. long and 28 to 34 fms. deep with 5 to 7 inches meshing. In the sardine fisheries, the nets are 200 to 230 fms. long and 25 to 30 fms. deep. Mackeral seines in general are from 180 to 250 fms. long and 8 to 20 fms. deep and of meshing 1-7/8 to 2 inches. Herring seines are 50 to 250 fms. long and 16 to 46 fms. deep with a meshing of 1½ to 1¾ inches. These seines are made of light cotton twine graded from a very small size on the ends to a heavier and stronger size in the bunt.

A purse seine is worked as follows. When a school of fish is sighted a skiff (small power boat) is lowered from the stern of the seine boat which continues to steam ahead while the men in the skiff move in the opposite direction, with the result that the net is drawn off the turntable into the water as the vessel encircles the shoal. The seine boat returns to the skiff when the net has been entirely paid out. The two ends of the purse line are recovered and taken to the purse winch and hauled in. While the bottom of the net is being closed by this means, the crew drive the fish away from the opening where the two ends of the net meet. When finally the bottom of the net has been entirely closed and the fish are crowded together the catch is taken on board with a dip net called a brailer. (Please see Fig. 10)

The vessel used for purse seine is called a Seine boat or Seiner. A typical seiner is a powered boat with vertical stern square stern decked fore and aft with pilot and deck houses forward. At the aft end there is a turn-table on which the seine net is stowed. For working the net there is a power winch with two gypsy heads located amid ships near the hatchway. Most of these

boats are built of wood and propelled by diesel engines—length 55 to 85 feet. overall, beam 15 to 22 feet, draft 5½ to 11 feet. There is a large wooden roller about 9 to 10 feet long and 6 inches in diameter fitted at the stern of a purse seine boat to lesson the friction between the railing and the seine net when the latter is being hauled on board or paid out.

A purse boat on the other hand is a double ended open boat of rugged construction. During fishing two such boats work in pairs, each carrying half of the seine net stowed near the stern, immediately forward of the aft thwart. The frames, gunwales and thwarts are all made of hard wood. Platforms of 2 to 3 feet in length are built about one ft. below the gunwale at each end. To maintain the boat on an even keel when the seine is carried, the stern is built with full buttors which gives greater buoyancy aft and the side planking is raised from 2 to 3 inches. These boats vary in length from 28 to 253 feet breadth 6 to 7 feet and depth 2 to 3 feet. The boats are provided with small davits on the port gunwales. Two snatch blocks through which passes the purse line when emerging from the water facilitate pursing the net.

(ii) TRAWLING.

A large conical net made of Manila, cotton or hemp twine is called a trawl. It has its lower part cut well back in the form of a U so that the fish when distributed are already enclosed at the sides and top. The lower edge is fitted with a heavy ground rope with the object of preventing the escape of fish underneath the net. Towards the narrow end of the net there is the cod end in which the fish are actually caught.

The size of the trawl depends upon the dimensions and power of the towing vessel, the largest being about 250 ft. long by 125 feet wide at the opening. The size of meshes varies from $\frac{1}{2}$ inch. from knot to knot in the cod end to 3 inches. in other parts. Manila is employed where rough work has to be done as in the larger otter trawls and beam trawls, and cotton and hemp in the smaller beam trawls, Flat trawls and shrimp trawls.

A Beam trawl is a triangular purse-shaped net with the mouth extended by a horizontal wooden beam and raised about 3 ft. from the ground by means of two iron frames or heads one at each end. The beam is fastened at each end to the top of an iron frame shaped like an irregular stirrup which is fitted to it at right angles by a square socket at the top. The upper part of the net only is fastened to the beam, the under portion dragging on the

ground. The beam trawl is towed by means of a single warp fastened to a bridle or span and attached to the trawl heads. Beam trawls are used only by small trawlers or sailing smacks. A full size beam trawl is from 40 to 50 feet. along the beam and about 100 feet. in length. The otter trawl requiring a constant steady strain to keep it fishing properly is unsuitable for a sailing trawler which is dependent on the vagaries of the wind. If the vessel looses headway, the boards may fall flat, thereby closing the mouth of the net, while the mouth of the beam trawl is always open irrespective of the vessel's speed.

Other trawl (Fig. 5) is a concical net supplied with 2 otter boards to which the drag ropes are attached. The action of the boards is such that by arrangement of the ropes they incline outward at an angle of about 25° when pulled through the water; this keeps the mouth of the net open. This type of trawl is proportionately much lighter than the beam trawl and has greatly increased the catch of fish swimming close to the sea bottom. It has a shorter square than the beam trawl but has wings in front.

The bag of the net is exactly the same as in the beam trawl. For small craft, the advantage of the otter trawl over the beam trawl is that the former stows into small space on deck so that a vessel may use a much larger otter trawl than beam trawl. A trawler will tow an otter trawl with a mouth considerably wider than its own length. An otter Board is also called trawl board or trawl door. (Fig. 4). One of the pair is attached on each side of the mouth of a trawl net to keep it open when the net is dragged. Otter boards are shod with iron and vary in size according to dimensions of the trawl net. The boards are attached to the warps by means of chains or iron brackets and arranged in such a way that the pressure of water due to the forward motion causes them to diverge and thus keep the mouth of the net open. In herring trawls a third extra otter board is occasionally used to lift the headline. The iron fittings of an otter Board to which the ends of trawl warps are fastened are called iron brackets. These brackets are so arranged as to give the boards the required angle which keeps the mouth of the trawl open while on operation.

A common otter trawl is made up of nine pieces of netting. The larger piece comprising most of the upper side of the net is known as top belly. An exactly similar piece on the underside of the net is known as bottom belly. The long triangular piece on each side forming

the tapering side walls between the top belly and bottom belly is known as belly wedge; the belly wedge is extended forward to the corner of the mouth of the trawl in a rectangular piece called the wing. In small nets, the belly wedge and wing are cut out together and made in one piece of netting. Inserted into the corners between the wings and leading edges of the belly pieces both above and below are four triangular covering pieces. Finally the bag or cod end is in the form of a tubular bag of heavier twine and smaller mesh.

In building this type of net the netting is made in a sheet, cut out into the desired parts and the pieces are fastened together. This sheet is made first of the required twine and cut as illustrated in the figures 1, 2 & 3.

When all parts of netting are joined, the net becomes ready for "hanging" i.e., fastening headrope and foot rope to the upper and lower edges of the mouth of the net, making them strong enough to carry heavy strains while in use. Upon the correct hanging of the net will depend to a great extent its capacity for catching fish.

The head and foot ropes should first be thoroughly stretched and all turns taken out of it. The rope is then stretched between posts a convenient height and hanging is begun from the centre mesh working outwards.

The net is hung on the foot rope by the third which is accomplished by hanging the wing on each side three meshes on the length of rope taken up by 2 stretched meshes. It is convenient to use a net needle. The end of flanging twine is Glove hitched to the rope and the needle is passed through the first 3 meshes from the middle of the net. It is then fastened to the rope with 3 half-hitches and this process is repeated right along the rope until the wing is reached. The ties on the headrope should be 3-3/8 inch apart and on the foot rope 4 inch apart, measured from the centre of one tie to the centre of the next. It is essential to space the ties correctly since a small consistent error may seriously reduce the efficiency of the net or even make it unworkable. When hung, the netting should be about 2 inches distant from the rope to allow flexibility. Later the headrope and foot rope are threaded with suitable floats and sinkers at convenient distance. Each end of the head and foot ropes is eye-spliced for the convenient attachment of otter board legs.

Herring trawl is used in waters where it has been found that at certain periods herring take to bottom. The dimensions of various parts are the same as in ordinary

trawl except that the end is longer and that the meshes of the cod end, belly and battings are all of same size. The speed of towing is greater, reaching $3\frac{1}{2}$ knots. Special devices are used for lifting the headrope.

Paranzar trawl is a Mediterranean trawl, also used in a modified form in the Californian fisheries, sometimes called Pareja trawl. It consists essentially of a bag with two elongated wings. At the end of each wing there is a short stout piece of wood which keeps them open vertically and to which the warps are fastened. One of the features of this gear is that the strain of the ropes is first taken by the head and ground ropes, then by wedge shaped pieces of netting on top and bottom called Scaglietti, directly to cod end. This arrangement allows the netting of the wings and throat to bulge out by the force of water while being towed, causing the meshes to stay open much more than if the strain of the bag was on the netting. The length of the net varies from 160 to 320 feet with a horizontal spread of 50 to 100 feet and a vertical opening of 3 to 4 feet. The Paranajr is fished with 2 boats working in pairs. In the Mediterranean, these are one masted lateen rigged sailing boats or steam vessels. In California, motor powered boats ranging in size from 56 to 72 feet in length and from 60 to 200 horse power are employed.

Shrimp trawl is a beam trawl towed by a small power boat usually in shallow waters. The length of beam varies from 10 to 30 feet according to the tonnage of the boat. The mesh is $\frac{1}{4}$ inch to 1 inch. In most countries now small otter boards 32 inch long and 26 inch deep are fitted instead of a beam.

Spanish trawl is a trawl net without boards worked by two boats. It is also called paranza or Pareja. Floating trawl or Larson trawl was invented by Robert Larsen of Denmark and is now in daily use in many countries. The net is dragged by either one or two boats. The net has 4 warps fastened to the 4 corners of the mouth of the net. The net is used with otter boards and spreaders. The depth at which the trawl operates is regulated by lengthening or shortening the warps.

A trawler is a sail or mechanically propelled vessel engaged in sea fisheries with a drag net, the most modern development of which is the otter trawl. Modern trawlers are single screw motor vessels designed with high sheer forward, in order to provide a dry fore deck upon which the dressing and sorting of the catch is carried out

at sea and low free board aft to reduce the vertical movement in the warps to a minimum. The crew are housed in the forecastle. The size of draggers has been greatly increased due to the greater distance covered to reach fishing grounds and to the larger cargoes of fish brought to port as compared to former times. Their length ranges from 75 to 250 feet with a horse power of 100 to 1200 and a free speed of 8 to 12 knots. Owing to the additional strain imposed on the hull when towing the fishing gear in rough weather the scantlings are usually in excess of the requirements for trading vessels of same tonnage. The speed of the vessel when towing is usually between $2\frac{1}{2}$ to 5 knots depending upon conditions and nature of sea bottom. Fittings on a trawler include, trawl gallows, trawl winch, a lowering mast, a special compartment for stowing the fleet of nets, and fittings at the low for paying out the warp. Trawl gallows are four strong fittings placed on both sides of a trawler, generally formed by an 'H' bar with bracket attachment to the deck. The purpose of the gallow is to raise the otter boards when working the trawl. Each gallow is provided with a heavy steel pulley at the top through which the trawl warp is hauled. A trawl which is specially designed to meet the requirements of trawling operations. It is provided with two large barrels one for each warp, which can be worked together or separately by the action of clutches. A small gypsyhead on each side is provided for the final hoisting of the net on board and also for pulling the drag ropes sideways. Trawl winches vary in size according to the depths which are likely to be encountered on the fishing grounds and the size of the vessel. They are provided with coiling gear for the warps placed on the forward side of the winch which consist of vertical rollers running on a horizontal truck. The rollers are connected through a rack and pinion to a hand wheel aloft the winch from which they receive their motion. Motor trawlers of small size with engines developing up to about 200 horse power have usually the winch directly connected to the main engines in order to avoid the installation of a separate motor. The operation of the winch in this case is effected by a pulley and belt drive operated from the forward end of the main shaft which through a second fore and aft shaft placed at deck level drives the winch through gearing.

Trawling.—Consists in dragging or towing at a reduced speed over the sea bottom a large conical net called the trawl. The mouth of the net is kept open by trawl boards or by a wooden span or beam. The speed of the

net over the sea bottom must be sufficient to prevent the fish caught from escaping through the mouth of the net. On the other hand, if the speed is excessive the net will not keep to the bottom and thus becomes inefficient. The speed of a trawler when fishing should be between 2 to 5 knots depending upon tidal currents also. A thorough knowledge of the nature of the sea bottom and currents prevailing on the fishing grounds is essential for trawling operations to be carried out successfully.

To begin with, the vessel is manoeuvred until she gets the wind on the beam. The net is then put over on the leftside. The forward otter board is lowered first about 10 fathoms of the drag rope attached to this board being run before the winch barrel controlling the otter drag rope is put into operation. Both ropes are then run out simultaneously until the net is at a suitable distance from the vessel, depending upon the depth of water. The main barrels of the winch are then put out of action by means of a clutch and the drag ropes are pulled sideways on board by a messenger chain worked from the winch drums so that they may be attached to the after towing bollard on that side of the ship over which the net is lowered.

The vessel in towing the trawl, causes the two other Boards to travel along the bottom, stretching open the mouth between them. In addition to the floats, the drag or friction of the water passing through the meshes of the net causes the top of the net to "belly upward." The foot rope which is weighed down by its leads, is dragged along in contact with sea bottom, causing the lower part of the net to remain close to the bottom. On account of the forward motion of the net through water a continuous stream enters its mouth and passes out through the meshes. Fish near the sea bottom which lie in the path of the net enter the mouth of the trawl and at once swept back into the net to be retained in the bag of smaller mesh at the narrow cod end of the trawl. The chances of a fish escaping after approaching the mouth of the trawl are lessened by having the head rope of the net shorter than the foot rope which ensures that the ground leading to the edge of the upper part of the net advances through the water a little ahead of the foot rope. Thus when fish on the bottom disturbed by the approach of the foot rope, dart upwards, they strike the top belly which form an apron over and is swept back into the net.

In most Japanese trawls, a flapper is placed inside the net to prevent the fish from escaping once they have entered the bag. This flapper is a trapezoidal piece of netting

with its front edge attached to the forward part of the upper belly, the corners of its back edge are attached to the lower belly.

In Germany a few trawlers have electrical fishing device. Two electrodes mounted on the stern of the vessel send out a series a short electrical impulses up to 2000 volts or two oppositely charged electrodes placed at the side of the nets mouth. These electrodes are connected to the vessel by wires running along the Trawl warps. The fish in the electrical field are stunned and swept into the net. It is claimed that this device is able to get 90 per cent of the total number of fish passing between the vessel and the net.

(iii) TROLLING.

Trolling is a method of fishing which consists essentially in dragging through the water a bait or bright object to which a hook is attached. This is also called whiffing and is employed in the capture of predaceous surface feeding fishes like tuna, bonito, horse meckerels, seer, Barracuda, etc. This kind of fishing is carried out by both sail or power boats. The sail boats use a few lines attached to the thwart and trailing over from the stern of the boat. In power boats, the lines are attached to one or more wooden poles rigged on either side of the boat or stern or amidship. The hooks are baited in some instances; artificial lures such as metal spoons, feather jigs, whale bone jigs are also used. The best speed for working this gear is from 4 to 5 knots.

Trolling lines (Fig. 9) are usually made of hard laid cotton with smaller linen leader lines followed by a piano wire leader to the baited hook for artificial bait. In order to control the depth of fishing, sinkers of spherical or oval shape are attached to the lines. The lines are of various lengths, the outer lines usually of 60 feet and the inside lines of 40 feet. In power boats it is usual to use 5 to 7 lines. The two outer lines lead from the ends of poles. The next pairs are attached to intermediate tips fastened half-way out on the main poles; upright rods on either quarter. The outer trolls are brought within reach by means of short piece attached to each fishing line 15 or 20 feet from the point where it is fastened to the pole and leading inboard. Each pole carries eye bolts for attaching the gear. Secured to each eye bolt is one complete trolling line assembly composed of a spring, a line pennant, a cotton trolling line, hauling line, leader wire, lure and leads. The spring consists of a steel spring or a short length of strong rubber tubing, with a piece of line in

parallel to limit its extention. From this is hung a 12 thread hemp line pennant with a 2 feet diameter brassing spliced to the end and made in such a length as to allow it to reach a convenient point on the after deck of the vessel when the lines were hauled. The main cotton trolling line is secured on the rail of the vessel at the required length to each from there to the ring on the pennant and extended for 25 to 40 fathoms to make up the actual trolling line. At the end of this line the gear is attached in the following sequence. Swivel split ring, lead, split ring, swivel, leader wire, swivel and lure. The use of split rings facilitates the quick changing of leads and lures whenever desirable. The main function of the spring is to break the initial force of the strike. When a fish strikes the line, the spring is extended by this force and once the inertia is overcome, it snaps back with sufficient violence to jolt the strength out of the fish, thereby making it easy to land.

(iv) LONG LINING.

Long lines consist of a main line into which are spliced smaller short lines called snoods. The snoods are fastened to the main at intervals which vary according to the species to be caught and the ground. A hook is fastened to each end of the snood. Each set of lines is coiled in a wooden tub kept below a "chute" provided at the stern of a boat in such a way that the hooks and lines would run out without fouling as the vessel moves with speed. Each set of lines is anchored and buoyed at each end. The number of hooks in each set will vary from 200 to 6,000. The main line is 1/8 inch to 1/4 inch thick of cotton or sisal the length depending upon the number of hooks to be operated in a set. The snood lines are also of cotton or sisal, nearly a fathom long and 18 lbs, strong, spliced to the main line at 1 or 2 fms. intervals. Number 4, 5 and 6 kirby bent hooks or Mustad hooks are commonly used in long lining. Each end of a set of long lines has a ground line which is secured to the ring of an anchor. A suitable length of 1/2 inch thick buoyline is attached to the crown of each anchor and to a can buoy at the other end. The hooks are baited either fresh, salted or frozen.

Long lines are hauled by hand over a roller secured to the rail. In bigger power vessels which operate a set running nearly to 15 miles, it is done by a power driven hauler installed on the deck worked either by an auxiliary

engine or by the main engine itself. A Japaneese type of the long line hauler is shown in Fig. 7.

(v) GILL NETTING.

Gill nets is a general name for fixed or drift nets in which the fish are caught by becoming entangled in the netting. The size of the mesh is such as to allow the passage of the head of the fish but not the body; the fish is thus caught by the gills. Gill nets can be divided into two main classes, the set or fixed gill nets and the drift nets. Drift nets are submerged curtain of netting one end of which is attached to a boat called drifter. These nets are allowed to drift with the tide or wind. The fish swimming in shoals or schools strike against the nets and are entangled by their gills in the meshes. The size of the meshes vary according to the species of fish which have to be captured. Large fleet of drift nets are usually worked with warps since the head lines alone would not be sufficient to stand the strain.

When fishing, sailing drifters take up a position astern on to the tide, and power boats drift with stem to windward. The nets are always laid out over the bow connected up in line and carried by the tide until they form one long line, one end of which is attached to the boat. The position of the nets is indicated by the bladder floats. The fish swim against the nets, push their heads through and then owing to their gills opening, find they cannot withdraw their heads and in this way are caught in large numbers. Set gill nets are anchored or staked in the position for fishing and may be fished at any depth. Both the drift and set gill nets should be hung fully, at least two meshes hung on the float line in the distance measured by one stretched mesh or two to one. The weight of twine used for the nets should be as light as possible. Heavy twine and such of those preservations which materially stiffen the twine reduce the efficiency of the gill nets. Visibility in clear water is another factor in favour of the use of light materials which can be more readily camouflaged in the water than heavier netting. The fish caught by drift gill nets are mostly pelagic species or those that swim freely in the upper waters of the sea. Those species are active swimmers and live in clear water so that drift gill nets when set in daylight are probably sufficiently visible to permit most fish to avoid them, this type of gear is therefore usually fished at night. On the other hand on very dark nights the slightest movement of the net in water stimulates into action the organisms responsible for phosphorescence and the glow of the net apparently is sufficient to keep the fish at their distance. Gill nets are therefore ordinarily most successful when

fished during twilight hours at dusk and dawn and during hours of moonlight. Set gill nets on the other hand catch the bottom fish like sharks, perches, etc. A standard gill net webbing usually includes 50 fathoms long "hung". 50% to the head and foot ropes. A fleet of such nets depend upon the size of the boat. The operation consists in piling a fleet of drift nets shakled on the after deck of the vessel and shot over the "Net chute" on the stern while proceeding downwind at half speed. But the set nets have to be shot over the "Net Chute" with the vessel running at full speed in order to anchor the nets across the current. In order to observe the drift of the nets and to warn passing vessels a dan buoy supporting an oil lantern or a battery light has to be fastened. Hauling the net is usually from the windward end (Figs. 8 & 9).

V. ADVANTAGE OF FISHING NETS MADE OUT OF SYNTHETIC FIBRES.

Advantages of Nylon are resistance to rot, catching ability when used in snaring gear and higher tensile strength. Disadvantages are difficulty in making good knots, loss of strength, 15 to 30 per cent after 10 to 24 hours staking in water. Nylon losses ~~loses~~ 43 per cent strength when knotted, compared with 10-35 per cent for cotton.

In the French nylon nets the knots have a tendency to loosen. This is eliminated by stretching the nets by a tackle and immediately fixing the knots, by staking the net in boiling water for some minutes. The nets can catch twice as much as the cotton nets. The elasticity is 25-45 per cent compared with 10-25 per cent for cotton. The strength decreases in water 5-30 per cent, while the cotton increases 11-37 per cent. The knots decrease the strength for nylon by 30-48 percent and for cotton by 10-35 percent.

In the U. S. Nylon nets, the thread is soft and flexible and the knots are fixed without any treatment. This thread seems the best available at present. Fishermen have reported good catching ability. The U. S. Nylon is considerably stronger than cotton, but loses much strength by knotting. The elasticity is only 17 or 18 per cent or not much more than that of cotton, which might be the reason that the knots are so well fixed.

The German nylon is called perlon and is quite different from the foregoing types which have large fibres making the thread absolutely of equal diameter and strength. Perlon is made like cotton threads. The fibre is but in short pieces forming a type of Nylon wool from which the thread is then twisted. It looks like cotton. The

elasticity is about 52 per cent, the strength decreases in water 5-20 per cent and by knotting 22 to 41 per cent. Perlon is suitable for mending because of its surface roughness. However this causes the surface to be covered by slime which is much more difficult to wash away than from nylon thread. Tests with pike traps have shown that the knots are well fixed, but no reports about the catching ability are available.

By all comparative fishing tests, nylon is found more efficient than cotton, nylon nets hang better in the water, although the specific gravity of nylon is lower and it does not absorb much water. Nylon does not swell as much as cotton and as thinner threads give better catching ability, this might be one reason for the better catch. The elasticity might be regarded as another reason.

Merits of "Amilan" netting are manifold. They are primarily ascribed to the unique attributes of "Amilan", as compared with cotton, silk, hemp, etc., which have been conventional types of fibre used for making nets, but some of the merits are collaterally derived as a result of Amilan being applied to practical use as fishing nets.

The following is a brief description of some of the Amilan's merits in connection with its use as fishing net material :—

(a) Amilan is non-corrosive in water.

Cotton and silk are totally corroded in about 20 days when immersed continuously in sea-water, whereas Amilan maintains its initial strength even after 147 days of continuous immersion. In other words, Amilan's durability can be said to be semi-permanent. This durability of Amilan makes possible the lengthening of operation hours, operations during wet seasons and long-distance operations which have been considered as impossible with cotton or silk nettings.

It follows, therefore, that Amilan nettings release fishermen of such troubles of drying and antiseptic treatment of nets and above all, preparation of spare nets.

(b) Amilan is tenacious and highly resistant to abrasion. It is more than ten times stronger against abrasion than cotton. Amilan yarn is more tenacious than cotton yarn of the same size.

(c) Amilan is far lighter than other fibres. The specific gravity of Amilan is 1.14, whereas that of cotton is 1.5. This difference of specific gravity being taken into

account, 250 denier Amilan yarn is as thick as 19.3 s cotton yarn. It can be said, therefore, that when Amilan yarn is compared with cotton yarn of the same size and length, the former is lighter to the extent of the difference between Amilan and Cotton in specific gravity. In addition, if strength is taken into account; Amilan Yarn having equal strength to cotton yarn can be less thick than the cotton yarn, hence if two nets of the same size are made, one with cotton and the other with Amilan yarn of the same size and strength, the Amilan net is far lighter than the cotton.

The light weight of the Amilan net leads to—

- (i) facilitating of operations, i.e., saving of labour,
- (ii) curtailing of fuel consumption.

(d) Amilan's water absorption is far less than other fibers' as follows :—

Cotton	43.9 per cent
Silk	18.7 per cent
Manila hemp	30.4 per cent
Amilan	6.7 per cent

This small water absorption, conversely, means that Amilan dries quicker than the others.

(e) Amilan is transparent and elastic.

Transparency and elasticity of yarn used for fishing nets, especially gill-nets have significant bearings upon the catches. This is why larger catches are claimed for Amilan-made gill nets.

Special caution is required in making nets with Amilan yarn because of its smooth surface. Much was said of the knot-slippage of Amilan-made nets at the early period of Amilan net manufacturing, but now every Amilan net, being heat-set, is cleared of this defect.

These merits are salient, particularly when Amilan is used for comparatively large fishing nets, such as purse-seines.

VI. GEAR PRESERVATION.

Fish nettings and lines deteriorate with use and even in storage and preservatives are used to slow down the process of spoilage. Deterioration may be due to physical wear and tear, weakening of the fibres due to the action

of bacteria, moulds, other organisms, etc., and to the action of fish slime, dead fish or other organic matter.

Pine tar is a good preservative. The nets well dried are dipped in a steam coil heated bath of tar at 65° to 80°C for about 3 minutes, wringing out well so as to give a good penetration and then immersing in salt water for about 12 hours. Tarred nets should be hung up to dry in the shade and if stowed in a heap before use, salt should be sprinkled between the layers of netting. Nets should not be tarred and stored for long periods, instead they should be tarred just prior to use. Tarring is recommended for "Heavy nets" such as trawls and seines.

Barking or tanning of fish nets especially the "light nets" like the gill nets is perhaps the oldest principle for preservation of fishing gear. Tanning materials are the barks of certain species of "Accacia" trees, Mangrove or oak trees. Extract of these barks is dissolved in boiling water and the net dipped, dried and redipped in the hot solution two or three times alternatively. Tanning must be repeated frequently every two or three weeks for nets in constant use.

Copper oleate and copper naphthenate are also good preservatives for "light nets". These with a copper content of at least 6 or 7%, about 5 lb. are dissolved in a gallon of kerosene. The net is dipped in this solution for several hours and then dried in shade in a well ventilated place.

While storing fishing nets, it is very important that the nets are cleaned and dried. Dead fish and other organic matter must be hand picked from the nets. Fish slime and dust are best removed by dipping the net in copper sulphate solution and washing the same within 36 hours after dipping. Nets for storage should be hung up dry in shade in a well ventilated shelter. Brief exposures to the sun may be beneficial in killing bacteria, but prolonged exposure especially when wet with rain and dried again in the sun is very injurious. In addition direct sunlight has injurious effects on preservatives such as tars and copper salts, causing them to react on the fibres. For long time storage, netting should be thoroughly washed, dried and piled with salt sprinkled throughout the webbing.

VII. DETECTION OF FISH BY ECHO SOUNDING.

The echo sounders have enabled fishermen not only to catch more fish but also to locate schools, estimate their size, depth, point of greatest concentration, as

well on the speed and direction in which the fish are moving. Frequently, it is possible to identify the species since certain schools have characteristic patterns.

The echo sounder scans the ocean beneath the surface of water, draws a chart of the bottom conditions and notes the presence of everything that has greater density than in water. Thus it serves as a navigation aid, enabling fishermen to avoid damage to boats and nets.

Echo sounding consists of sending high frequency sound waves down into the water from the bottom of the boat. Fragments of signs echo back from whatever they hit. The returning echos are picked up by a receiver, amplified by means of electric tubes and recorded on a horizontally moving chart.

The equipment consists of 2 main parts, recording unit and a transducer. The former about the size of a household medicine cabinet, is usually installed in the wheel house or other convenient location, while the latter is netted on the bottom of the craft to send and receive signals. By using the known speed of the sound in water (approximately 4,800 feet per second) the unit automatically measures the depth of water and the time required for the echo to "bounce". It measures the depth of a school of fish similarly.

As the ship advances, the echo of the signals emitted are received and depth computed automatically. The stylus notes the *information* through an aluminium oxide coating on a special carbon-type paper that moves slowly across the box. The water level appears as a continuous straight line on the chart. The ocean line is also continuous but zigzags up and down according to the contour of the bottom. Schools of fish appear as dark smudges.

The search for pelagic fish can be easy or exasperatingly difficult. It depends on the frequency with which shoals are encountered and great deal on the skill of the operator in interpreting the charts. Where the presence of fish is suspected, the sounder must be kept burning continuously. Care is required to find small and scattered shoals and a technique described below based on experience in different areas and on various species of fish.

(1) Since most small shoals of pelagic fish move bodily with the tidal stream, the search should be carried out along the tidal stream rather than across it.

(2) The recorder should be watched by someone other than the helmsman, for the chart reader should note every mark made by the stylus. A faint line or a few small dot may indicate fish.

(3) When indications have been seen, the engine should be stopped; and once the ship begin to slow down the lines or dots will resolve themselves into the outline of a shoal.

(4) When ring netting, it is advisable to make at least two runs over the target before shooting the net, so that the exact size of the shoal can be gauged.

When using echo sounders in drift net fishing, the problems are somewhat different from those encountered in ring netting; here also useful information may be obtained from sounding chart. Where shoals are spotty one can be reasonably sure of a satisfactory catch. In drift net fishing the echo sounder is of greatest value in deeper waters.

Type 1373 Raytheon fathometer is specially designed for small craft. It records and produces a clear and undistorted horizontal graph of the bottom contour. Because of its relatively high rate of 96 soundings per minute it produces clearly defined records of variation of the bottom's depth. The type of echos recorded will indicate to the experienced operator the character of the bottom, a light marking is indicative of soft mud, while a cleanly defined marking discloses hard gravel, clay or rock. In fog or darkness the fathometer chart supplies information needed for "bottom navigation", so that the vessel can be guided safely to port by coordinating depth soundings.

If one wants to get the best results out of these machines, he should learn the small but valuable points concerning their installation and general maintenance. It is very important that the following 5 units of the machines are properly and correctly installed:—

1. *Recorder unit*—Installed in a vertical position usually in the wheel house or where the chart will be visible to the skipper, care should be taken to provide space so that full accessibility may be had for inspection.

2. Power supply unit (D.C.) should be mounted in a vertical position in a dry and well ventilated location. The supply table should be of heavy gauge wire of proper size,

3. Transducer—The success of a fathometer depends upon the proper location and mounting of the Transducer. The best location of this unit is well forward. A good rule is to locate it from 1/5 to 1/3 the vessel's length from the bow. Directly placing it under the engines should be avoided. It should be securely fastened to the ship's keel about 2 inches above the shoe.

4. Hull stuffing tube—This is used to provide a water tight entrance into the boat's hull for the transducer cable.

THE FOLLOWING DETAIL THE MAINTENANCE OF THE FATHOMETER.

1. Cleaning—Carbon deposited in the recorder unit, due to operating in the marking process, should be brushed away frequently to prevent smudges on the paper and abrasing action on the moving parts.

2. Lubrication—The following need be lubricated, two cups on the motor, two cups on the outport shaft, idle pulley bearings, stay hinge, roll centres, platen hinge brace and gear box.

3. Zero adjustment—The portions of the recording styli should be occassionally adjusted to compensate for the burning away of the stylus points.

VIII MARINE ENGINES AND THEIR MAINTENANCE.

The following types of Engines are used for installation in fishing boats: Petrol, kerosene (paraffin), semi-diesels and diesels :—

Petrol Engines :—Petrol engines are generally modified automobile engines with a larger lubricating oil sump, modified cooling water system and reverse gear.

Kerosene Engines :—These engines are generally of the same design as that of the gasoline type and are usually started on petrol. There is a separate Kerosene Carburator, which is switched in, when the engine reaches its working temperature after starting on Petrol.

Semi Diesels :—Semi-Diesel engines are slow running, heavy duty oil engines usually with few cylinders. They are mostly of the two cycle type and contain few

moving parts. They have to be preheated to start ; and are heavy engines and vibrate more than any other engine.

Diesels :—Diesels are theoretically the most efficient engines for fishing boats. The initial price of diesels is high and the smaller sizes need top grade diesel fuel. They have a low fuel consumption per horse power as compared to other engines.

Since cost of fuel for both Petrol and Kerosene engines being generally high, semi-diesels and diesels have taken the place of these engines in fishing boats in recent years. Diesels being the more popular engines of fishing boats in this State, the instructions given below pertain mainly to diesels.

DIESELS.

Diesels are four stroke internal combustion engines. These engines have almost the same moving parts as the gasolene engine. But because of their greater compression and higher efficiency, they do a greater amount of work for the same amount of fuel. Diesel powered craft has a much larger cruising range than gasolene powered vessels of the same horse power. The cardinal difference between diesel and petrol engine is that the diesel has no electrical ignition system, no spark plugs or carburetors. These are replaced by injunctors.

Since diesels are four cycle engines, four strokes of the piston are required to complete one power stroke. The working cycle is as under :—

- (a) *Suction Stroke.* The air inlet valve is open ; the piston moves down and draws air into the cylinder.
- (b) *Compression Stroke.* Both valves are closed ; the piston moves up compressing the air and thereby heating it ; a small quantity of fuel is injected under high pressure before the crank reaches its Top Dead centre, (T.D.C.)
- (c) *Power or Working Stroke.* The fuel ignites and expands and the piston is forced down.
- (d) *Exhaust Stroke.* The exhaust valve opens before the crank reaches the Bottom Dead Centre (B.D.C.). The piston moves up pushing out the burnt gas,

RUNNING MAITENANCE.

Follow the instruction book supplied with each engine by the makers. The instructions given below would serve only as a general guide.

Inspection:—After an engine has been installed after overhaul a prestarting inspection should be made. Fill the fuel tanks with the correct grade fuel oil. Fill the crank case with the recommended lubricating oil. Slip the gear into neutral position. Open the sea cock and fuel oil cock. Place the throttle in the starting or idling position. Start the engine either by cranking or by pressing the button if a battery or compressed air is used. When the engine starts running check the oil pressure, and if and a guage is provided check the discharge of cooling water (if a water cooled type)

Prior to stopping the engine, move the throttle lever to the idling position, run the engine for five minutes and then stop the engine as recommended by the makers. Close the fuel and sea cocks.

1. Daily.—

Check the lub. oil level on engine dip stick.

Check the foundation bolts; tighten if necessary.

Give all grease cups a turn.

2. Monthly.—

(1) Clean the fuel oil filter.

(2) Clean the air cleaner.

(3) Check cylinder head joints for leaks. Tighten nuts if necessary.

(4) Check all nuts, bolts and keys.

(5) Make sure the vent hole in fuel tank filler cap is clear.

(6) Clean strainer on cooling water sea cock.

3. Every 250 Hours.—

- (1) Drain the lub. oil sump, flush out with the prescribed fushing oil and refill with new oil.
- (2) Test fuel system for leaks.
- (3) Remove injectors and test spray. If in order replace without interference. If injectors are not in order get them tested.

Note.—

Adjustments for injectors should be attempted only with proper tools and equipments.

- (4) Check valve clearance ; adjust if necessary.
- (5) If a reduction gear box is provided drain and fill with new oil.

Every 1000 Hours.—

- (1) Remove cylinder head; decarbonise piston top and inside of inlet and exhaust ports.
- (2) Examine and grind in, if necessary, the inlet and exhaust valves.
- (3) Withdraw the pistons and carefully clean out oil return holes.
- (4) Remove plug and drain sediment from the reverse gear box.

Every 2000 Hours.—

- (1) Examine large end bearing.
 - (2) Wash out lub. oil pipes.
 - (3) Clean fuel tank to remove sludge.
 - (4) Clean water spaces in cylinder head.
-

TROUBLE LOCATING CHART.

Trouble.	Reason.	Causes.	Suggested Remedy.
Engine not starting	Fuel supply failure.	No fuel in tank Fuel cock closed.	Fill the tank Open the cock and bleed the system if necessary.
		Air in fuel line.	"Bleed" the fuel line.
		Fuel filter choked.	Clean the filter, Replace the element if necessary.
		Faulty injector nozzle.	Test the nozzle; fit a new one if need be.
		Fuel pump sticking.	Clean the pump, replace if necessary.
Poor compression.		Valves sticking.	Free the valves.
		Cylinder head loose.	Tighten all nuts.
		Cylinder head gasket leaking.	Fit new gasket.
		Piston rings stuck in grooves.	Check the rings and clean the piston.
		Worn cylinder liner and piston.	Overhaul the engine replace the liner and piston rings.
		Valves not beating properly.	Check the tappet clearance; Check valve springs, grind the valve if need.
Battery run down.			Check the connection and recharge the battery.
No air in the compressed air tanks.			Check the connection and valves for leaks, recharge the tanks if a separate motor is available.
Engine starts but fires in intermittently or soon stops.	Fault fuel supply.	Air in fuel lines.	"Bleed" the system.
		Water in fuel.	Drain the tank and till with clean fuel and bleed the system.
		Faulty injector nozzle.	Test the nozzle and adjust or fit a new nozzle.
		Fuel filter choked.	Clean the filter.

TROUBLE LOCATING CHART—*contd.*

Trouble.	Reason.	Causes.	Suggested Remedy.
	Faulty compression.	Broken valve spring.	Replace.
		Sticking valve.	Free the valve.
Engine runs unevenly.	Wrong type of fuel.	Fuel with poor burning quality.	Drain the tank and fuel system and re-fill with suitable fuel recommended by makers of the engine.
	Faulty injector timing.	Control mechanism set wrongly.	Adjust according to the makers instructions.
	Engine lacks "pep".	Obstructed spray nozzle.	Clean the spray tips of the ineffective injector.
	Excessive exhaust back pressure.	Dirty exhaust silencer or muffler.	Clean the silencer of carbon deposits.
		Too great flow of cooling water.	Check the flow of circulating water and if need reduce the flow.
Engine lacks power with dirty exhaust.	Faulty fuel supply.	Broken fuel pump spring.	Replace.
		Faulty injector nozzle.	Fit a new nozzle.
Dirty engine.	Blocked exhaust.	Clean.	
		Faulty piston ring.	Replace.
		Excessive carbon deposit on piston and cylinder head.	Decarbonize.
		Dirty air filter.	Clean.
Faulty running.	Knocking.	Carbon on piston crown.	Decarbonize.
		Fuel timing too far advanced.	Adjust timing.
		Broken piston ring.	Replace.
		Worn large end bearing.	Replace and check lubrication.
		Loose fly wheel.	Tighten.
Overheating.	Over load.		Reduced the load.
		Water supply failed.	Check the system; clean the filter, Fill the sump and check the system.

TROUBLE LOCATING CHART—contd.

Trouble.	Reason.	Causes.	Suggested Remedy.
		Lubricating oil failure.	
		Excessive valve tappet clearance.	'Adjust.
Sudden stop.	Empty fuel tank.		" bleed " the system,
		Choked fuel injector.	Clean or fit a new nozzle.
		Fuel pipe broken.	Repair.
	Excessive vibration.	Loose foundation bolts.	Tighten nuts.
Engine stalls.	Idling speed too low.	Governor needs re-adjusting.	Readjust.
	Tool low cooling water temperature or too great flow of water.	Climatic conditions ; the pump delivering too great supply of water.	Adjust the sea cock.
	Cylinders cut out.	Faulty injection.	Locate missing cylinders, test pumps and fuel lines.
	Choked fuel filters.	Dirt in fuel oil.	Remove and clean filter element.
Engine will not shut off.	Gradual wear of the control and incorrectly adjusted controls.	Controls not checked with sufficient regularity ; controls not checked after overhaul.	Remove and replace all the injectors and Governor mechanism after adjustment.

Important Don't's,

- (i) Do not stop the engine by using the decompressor lever.
- (ii) Do not stop the engine by using the fuel stop cock.
- (iii) Do not allow the fuel tank to run dry.
- (iv) Do not allow the engine to run without cooling water (in case of water cooled engine types.)
- (v) Do not slip the gear lever to the head and astern positions. Press the lever right home either way.

Table showing a fishing Calendar for the East Coast of Madras State.

District.	Name of fishing centre.	January.	February.	March.	April.	May.	June.
Chingleput	1 Pulicat coast.	Mullet Prawns Silver bellies Ribbon fish White bait Jew fish	Silver bellies Sabre fish Jew fish White bait Mullet Ribbon fish	White bait Horse Mackerel Mullet Beer	Horse Mackerel White bait Mackerel Pomfret Lactorius Mullet	Horse Mackerel Jew fish Flying fish Sardines Mullet	Ribbon fish Jew fish Flying fish Mullet Horse Mackerel Prawns
Madras ...	2 Madras ...	Silver bellies Ribbon fish Lactorius White bait Jew fish Sabre fish	Silver bellies Ribbon fish Lactorius Sabre fish Jew fish	Lactorius Horse Mackerel Hilsa	Pomfret Lactorius Horse Mackerel	Flying fish Pomfret Horse Mackerel Sabre fish	Flying fish Pomfret Jew fish Silver bellies Horse Mackerel Sillago
Chingleput	3 Kada-pakkam.	Silver bellies Horse Mackerel Jew fish Ribbon fish Beer Prawns	Mullet Horse Mackerel Ribbon fish White bait Sabre fish	White bait Sardines Jew fish Horse Mackerel Indian Salmon Prawns	Sardines White bait Jew fish Horse Mackerel Mullet Prawns	Sardines Jew fish Pomfret Flying fish White bait	Pomfret Horse Mackerel Mullet Ribbon fish Jewfish Flying fish

South Anoot	4	Ouddalore	Silver bellies Ribbon fish Horse Mackerel Lactarius Seer Jew fish	Mullets Horse Mackerel Ribbon fish White bait Sabre fish Indian Salmon	White bait Jew fish Horse Mackerel Horse Pomfret Jew fish	Sardines White bait Jew fish Horse Mackerel Mullet Jew fish Ribbon fish	Flying fish Pomfret Horse Mackerel Mullet Jew fish Ribbon fish		
Do.	5	Porto Novo	Ribbon fish Jew fish Cat-fish Lactarius Sharks and Rays Pomfret	Jew fish Cat-fish Ribbon fish Pomfret Lactarius Seer	Jew fish White bait Sabre fish Pomfret Seer White bait	Jew fish Ribbon fish Sabre fish Pomfret Seer White bait	Flying fish Jew fish Sharks and Rays Horse Mackerel Lactarius		
Tanjavoor	6	Vanagiri	Ribbon fish Jew fish Cat-fish Lactarius Pomfret	Jew fish Cat-fish Ribbon fish Pomfret Lactarius Seer Horse White bait	Jew fish Ribbon fish Sabre fish Pomfret Lactarius Seer White bait	Jew fish Ribbon fish Sabre fish Pomfret Lactarius Seer White bait	Flying fish Jew fish Sharks and Rays Horse Mackerel Ribbon fish Lactarius		
Do.	7	Tranquebar	Ribbon fish Miscellaneous	Ribbon fish Miscellaneous	Ribbon fish Horse Mackerel Skates and Rays.	White bait Ribbon fish Horse Mackerel Skates and Rays.	Horse Mackerel White bait Oat-fish Miscellaneous	Flying fish Dussumeria Lactarius Miscellaneous	
Do.	8	Nagapat-nam.	Ribbon fish Miscellaneous Mullet Cook up Hilsa Prawn	Ribbon fish Miscellaneous Sharks and Rays Lactarius Seer Jew-fish.	White bait Hilsa Ribbon fish Seer Mullet Skates and Rays	Horse Mackerel White bait Cat-fish Hilsa Pomfret	Flying fish Dussumeria Lactarius Prawns Cook-up		

<i>No.</i>	<i>District.</i>	<i>Name of fishing centre.</i>	<i>January.</i>	<i>February.</i>	<i>March.</i>	<i>April.</i>	<i>May.</i>	<i>June.</i>
Do. ... 9	Arootturai.	Mullets Cook-up Indian Salmon Prawns Hilsa Seer	Hilsa Sharks and Rays Lactarius Seer	Hilsa Indian Salmon Cook-fish Seer	Sharks and Rays Cat-fish Hilsa Pomfret	Cat-fish Cook-up Jew-fish Indian Salmon	Flying fish Sharks and Rays Mullet Indian Salmon	Flying fish Sharks and Rays Mullet Cock-up Jew-fish
Do. ... 10	Point Calimere.	Sharks and Rays Mullets Prawns Jew-fish	Mullets Sharks Jew-fish Cook up Prawns	Indian Salmon Cat-fish Prawns Sharks and Rays Cook-up	Indian Salmon Cat-fish Cook up Jewfish Shark and Rays	Jew-fish Cat-fish Mullet Cook-up Pomfret	Sharks and Rays Cat-fish Cook-up Jew-fish	Mullet Sharks and Rays Cat-fish Cock-up Miscellaneous Cat-fish
Do. ... 11	Muthupet.	Mullets Cat-fish Jew-fish Prawns Seer Hilsa Silver bellies	Mullets Silver bellies Jew-fish Prawns Cook-up Cat-fish Silver bellies	Jew fish Mullet Cat-fish Cook up Indian Salmon	Jew-fish Cat-fish Mullet Cook-up Indian Salmon	Cat-fish Jew-fish Mullet Prawns Pomfret	Cat-fish Jew-fish Mullet Prawns Pomfret	Mullet Sharks and Rays Cat-fish White bait Indian Salmon
Do. ... 12	Adiram-pattam.	Sharks and Rays Jew-fish Cat-fish Horse Mackerel Indian Salmon Hilsa	Sharks and Rays Cat-fish Jew fish Horse Mackerel Indian Salmon Cock-up	Sharks and Rays Cat-fish Horse Mackerel Indian Salmon Prawns	Sharks and Rays Cat-fish Horse Mackerel Indian Salmon Jew-fish	Sharks and Rays Cat-fish Pomfret Mullet Jew-fish	Sharks and Rays Sharks and Rays Indian Salmon Pomfret Mullet Sabre fish Flying fish	Jew-fish Sharks and Rays Indian Salmon Pomfret Mullet Prawns Cock-up

Do. ... 13	Sethubava-chatram,	Mullets Jew-fish Cat-fish Sharks and Rays Crabs Hilsa	Sharks and Rays Mullets Jew-fish Crabs Misoellaneous	Indian Salmon Sharks and Rays Mullets Jew-fish Cook-up	Sharks and Rays Oat-fish Rock-cod Cock up Jew-fish Mullet Indian Salmon	Indian Salmon Oat-fish Rook-oo! Cook-up Sabre-fish Flying fish	Mullets Indian Salmon
Do. ... 14	Ammapat-nam.	Mullets Sharks and Rays Seer Crabs Prawns Sardines	Sharks and Rays Seer Prawns Cat-fish Jew-fish Prawns Sabre-fish	Indian Salmon Sharks and Rays Sardines Jew-fish Prawns Indian Salmon	Sharks and Rays Seer Sardines Cock up Jew-fish Indian Salmon	Sharks and Rays Oat-fish Sardines Sabre-fish Seer Flying fish	Sharks and Rays Sardines Jew-fish Cat-fish Seer Prawns
Rama-natha-narayana.	15 Nambuthai-lai.	Cat-fish Horse Mackerel Misoellaneous Silver bellies	Sharks and Rays Sharks Misoellaneous	Horse Mackerel Jew-fish Prawns Seer	Horse Mackerel Sharks and Rays Crabs, Miscellaneous	Horse Mackerel Sharks and Rays Crabs, Miscellaneous	Horse Mackerel Sharks and Rays Crabs, Miscellaneous
Do. ... 16	Pamban, Raneshwaran Island and Dhanushkodi.	Sardines Sharks and Rays Seer Perches Sabre-fish	Sharks and Rays Sardines Perches Sabre-fish	Sardines Sharks and Rays Perches Beer-fish	Sharks and Rays Sardines Seer-fish Sabre-fish	Sharks and Rays Seer Sabre-fish	Sharks and Rays Seer Sabre-fish
Do. ... 17	Attankarai.	Dussunneria Sharks and Rays Pomfret Seer Indian Salmon	Oat-fish Hilsa Dussunneria Pomfret Seer Indian Salmon	Hilsa Dussunneria Pomfret Seer Indian Salmon	Sardines Horse Mackerel Seer Sharks and Rays Seer	Sardines Horse Mackerel Seer Sharks and Rays Seer	Sardines Seer Cat-fish Skates and Rays Cat-fish

No.	District.	Name of fishing centre.	January.	February.	March.	April.	May.	June.
Do. ... 18	Mukur	..	Dusunmeria Seer Silver bellies Miscellaneous	Cat-fish Sardines Silver bellies Mackerel Dusunmeria	Dusunmeria Indian Salmon Seer Hilsa Miscellaneous Cat-fish	Sardines Seer Miscellaneous Pomfret Jew-fish Prawns	Miscellaneous Sardines Seer	Miscellaneous Sardines Seer
Do. ... 19	Tirunelveli.	Sippikalam.	Sardines Silver bellies Jew-fish Seer Miscellaneous Hilsa	Dusunmeria Sardines Silver bellies Jew-fish	Dusunmeria Silver bellies Seer	Sardines Sabre-fish Horse Mackerel Miscellaneous	Sardines Sabre-fish Engraulis Jew-fish Miscellaneous	Sabre-fish Sardines Horse Mackerel Sharks and Rays
Do. ... 20	Tuticorin ...		Sardines Engraulis Miscellaneous Perches Lutjanus Seer	Sardines Perches Miscellaneous Lethrinus Sharks and Rays Sharks and Rays	Sardines Engraulis Miscellaneous Lethrinus Sharks and Rays Sharks and Rays	Sardines Sabre-fish Horse Mackerel Perches Miscellaneous	Sardines Sabre-fish Engraulis Sharks and Rays Perches Seer	Sabre-fish Sardines Seer Perches Horse Mackerel Seer
Do. ... 21	Pinnakayal.		Sardines Dusunmeria Hilsa Miscellaneous	Sardines Dusunmeria Pellona Miscellaneous	Sardines Dusunmeria Miscellaneous Sharks and Rays	Sardines Miscellaneous Sabre-fish Sharks and Rays	Sardines Jew-fish Engraulis Sharks and Rays	Sardines Miscellaneous Sabre-fish Sharks and Rays
Do. ... 22	Periyathalai.		Sardines Jew-fish Sharks and Rays Seer Engraulis Sabre-fish	Jew-fish Sharks and Rays Pellona Dusunmeria Seer	Dusunmeria Sharks and Rays Engraulis Cat-fish	Dusunmeria Pomfret Seer	Sharks and Rays Jew-fish Sardines Seer	Sharks and Rays Sabre-fish Sardines Horse Mackerel

Rama-nathapura-m or	23	Ovari	Lactarius Jew-fish Pomfret Dussumeria Miscellaneous Cat-fish	Sharks and Rays Jew-fish Cat-fish Lactarius	Cat-fish Cat-fish Jew-fish Miscellaneous	Sharks and Rays Cat-fish Jew-fish Miscellaneous	Cat-fish Cat-fish Jew-fish Miscellaneous	Sharks and Rays Oat-fish Pomfret Mackerel Miscellaneous	Sharks and Rays Oat-fish Pomfret Mackerel Miscellaneous
Tirunel-veli	24	Idinthakarai.	Cat-fish Laotarius Ribbon-fish Miscellaneous Seer	Oat-fish Jew-fish Sharks and Rays Miscellaneous Seer	Oat-fish Jew-fish Sharks and Rays Miscellaneous	Oat-fish Dussumeria Sharks and Rays Jew-fish Miscellaneous	Sardines Cat-fish Sharks and Rays Jew-fish Miscellaneous	Oat-fish Pomfret Mackerel Laotarius	Sabre-fish Miscellaneous
Do. ...	25	Kootapulli	Oat-fish Sharks and Rays White bait Sardines Jew-fish	Oat-fish Sharks and Rays White bait Sardines Jew-fish	Oat-fish Horse Mackerel Sharks and Rays Jew-fish Miscellaneous	Oat-fish Dussumeria Sharks and Rays Jew-fish Miscellaneous	Oat-fish Sharks and Rays Jew fish Miscellaneous	Oat-fish Jew fish Miscellaneous	Sabre-fish Miscellaneous
Kanya-kumari	26	Cape-Gomorin.	Seer Shark Oat-fish Dussumeria Laotarius Ribbon fish Lobster	Seer Oat-fish Perches Shark Chorinemus Lobster Sea-bream	Laotarius Seer Oat-fish Perches Tunny Sea-bream	Laotarius Seer Oat-fish Perches Tunny Sea-bream	White bait Laotarius Shark Horse Mackerel Ribbon fish	White bait Laotarius Shark Horse Mackerel Ribbon fish	Ribbon fish Horse Mackerel Shark Prawns Rook Cod
Do. ...	27	Mutton	Shark Cat fish Dussumeria Lates Sea bream Lobster Perches	Shark Oat-fish Lobster Horse Mackerel Seer Balistes Rook Cod	Laotarius Perches Horse Mackerel Pomfret Sea-bream Balistes Lobster	Laotarius Perches Horse Mackerel Pomfret Sea-bream Balistes Lobster	White bait Shark Laotarius Ribbon fish Horse Mackerel	White bait Shark Laotarius Ribbon fish Horse Mackerel	Ribbon fish Shark Horse Mackerel Prawns Rook Cod
Do. ...	28	Kadiapatnam	Lates Sea-bream Sharks Rook Cod Lobster Balistes	Seer Oat-fish Perches Shark Horse Mackerel Lobster	Laotarius Perches Shark White bait Sea bream Balistes	Laotarius Perches Shark White bait Sea bream Balistes	White bait Laotarius Pomfret Shark Perches Rook Cod	White bait Laotarius Ribbon fish Horse Mackerel Shark Prawns Rook Cod	Shark Ribbon fish Horse Mackerel Prawns Rook Cod

District.	No.	Name of fishing centre.	January.	February.	March.	April.	May.	June.
Do. ... 29	Colachel	Sea bream Seer Shark White bait Lobster Balistes	Seer Perches Rock Cod Horse Mackerel Tunny Lobster	Seer Perches Sea bream Rock Cod Horse Mackerel Tunny Lobster	White bait Lactarius Pomfret Shark Perches Rock Cod	White bait Lactarius Pomfret Shark Perches Rock Cod	Ribbon fish Shark Horse Mackerel Prawns Rock Cod	Ribbon fish Shark Horse Mackerel Prawns Rock Cod
Do. ... 30	Ennayam-puttenthura	Sea-bream Shark Rock Cod Dussumeria Lobster Balistes	Perches Seer Cat-fish Sea-bream Lobster Rock Cod	Perches Seer Cat-fish Sea-bream Lobster Rock Cod	Lactarius White bait Shark Pomfret Perches Rock Cod	Lactarius White bait Shark Pomfret Perches Rock Cod	Ribbon fish Shark Horse Mackerel Lactarius Shark	Ribbon fish Shark Horse Mackerel Prawns Horse Mackerel Perches
Do. ... 31	Thuticoor	Rock Cod Seer Mackerel Shark Perches Balistes	Rock Cod Seer Tunny Perches Sea bream Balistes	Perches Rock Cod Sea bream Tunny Lactarius Shark	Pomfret Rock Cod White bait Pomfret Perches Rock Cod.	Lactarius Shark White bait Pomfret Perches Rock Cod.	Ribbon fish Shark White bait Lactarius Shark	Ribbon fish Shark Prawns Horse Mackerel

Table showing a fishing Calendar for the East Coast of Madras State—cont.

No.	District.	Name of fishing centre.	July.	August.	September.	October.	November.	December.
Chingleput 1	Pulicat coast.	Sardines Mackerel Mullets Lactorius Prawns	Jew fish Mullet Horse Lactorius Lactorius	Jew fish Mulleis Horse Mackerel Prawns	Jew fish Mulleis Horse Mackerel Lactorius	Ribbon fish Jew fish Mulleis Prawns White bait Lactorius	Ribbon fish Sabre fish Mulleis Prawns Jew fish Lactorius	Silver bellies Cat-fish Mulleis Lactorius Prawns
Madras ... 2	Madras	... Silver bellies Ribbon fish Lactorius Jew fish	Ribbon fish Jew fish Horse Lactorius	Hilsa Lactorius Horse Mackerel Lactorius	Hilsa Lactorius Horse Mackerel Pomfret Synamoris	Silver bellies Ribbon fish Hilsa Inctarius Jew fish Bole	Sharks Pomfret Jew fish Hilsa Ribbon fish Lactorius	Silver bellies Ribbon fish Lactorius Indian Salmon Jew fish
Chingleput 3	Kada-pakkam.	Sardines Mackerel Mullets Silver bellies Lactorius Ribbon fish	Horse Mackerel Jew fish Sardines Mulleis	Ribbon fish Horse Jew fish Sardines Mulleis	Sardines Hilsa Jew fish Horse Mackerel Mulleis	Mackerel Mulleis Sardines White bait Prawns	Mulleis Seer Sardines White fish Sabre fish Ribbon fish	Ribbon fish Jew fish Seer Prawns Sardines Mulleis
South Arcot 4	Oondalorai.	Sardines Mackerel Mullets Silver bellies Lactorius Ribbon fish	Horse Mackerel Jew fish Sardines Mulleis Sardines	Ribbon fish Horse Mackerel Sabre fish Jew fish Mulleis	Sardines Hilsa Horse Mackerel Mulleis	Horse Mackerel Sharks and Rays Sardines Mulleis	Mulleis Horse Mackerel Ribbon fish Cat-fish Seer Prawns Sardines Mulleis	Ribbon fish Jew fish Seer Prawns Sardines Mulleis

No.	District.	Name of fishing centre.	July.	August.	September.	October.	November.	December.
South Aroot	5	Porto Nova.	Jew fish Sardines Horse Mackerel Cat-fish Pomfret	Jew fish Ribbon fish Horse Mackerel Sabre fish Sharks and Rays Flying fish	Horse Mackerel Ribbon fish Jew fish Pomfret Sharks and Rays	Horse Mackerel Sharks and Rays Jew fish Dussumeria. Oat-fish White bait	Horse Mackerel Jew fish Ribbon fish Cat-fish Sharks and Rays	Ribbon fish Jew fish Mackerel Sabre fish Sharks and Rays Cat-fish
Tanjavoor	6	Vanagiri ...	Flying fish Jew fish Pomfret Mackerel Cat-fish Rays Flying fish	Jew fish Horse Mackerel Ribbon fish Sharks and Rays Cat-fish	Horse Mackerel Jew fish Ribbon fish Sabre fish Pomfret Sharks and Rays	Horse Mackerel Sharks and Rays Jew fish Dussumeria Cat-fish	Ribbon fish Jew fish Mackerel Sabre fish Sharks and Rays Pomfret	Ribbon fish Jew fish Mackerel Sabre fish Sharks and Rays Cat-fish
Do.	7	Tranquebar.	Flying fish Ribbon fish Sharks and Rays Miscellaneous	Skates and Rays Jew fish Ribbon fish Cat-fish Miscellaneous	Jew fish Cat-fish Horse Mackerel Skates and Rays	Horse Mackerel Jew fish Sharks and Rays Pomfret	Horse Mackerel Jew fish Sharks and Rays Rays Ribbon fish	Ribbon fish Miscellaneous
Tanjavoor	8	Nagapatnam.	Flying fish Ribbon fish Mullet Cat fish Sharks and Rays	Jew fish Indian Salmon Cat fish Prawns Ribbon fish Miscellaneous	Sharks and Rays Jew fish Indian Salmon Mullet Sharks and Rays	Horse Mackerel Jew fish Sharks and Rays Indian Salmons Sharks and Rays	Horse Mackerel Jew fish Sharks and Rays Cook-up Indian Salmon Prawns	Ribbon fish Mullets Miscellaneous Indian Salmon Dussumeria Sharks and Rays

Do.	9	Aroothurai	Pomfret Mullets Cat fish Indian Salmon Jew fish	Sharks and Rays Jew fish Indian Salmon Mullets Cock-up	Indian Salmon Jew fish Prawns Sharks and Rays	Jew fish Indian Salmon Mullets Prawns Oat fish	Mullets Cock-up Indian Salmon Prawns Dussumeria Sharks and Rays
Do.	10	Point Calimere	Sharks and Rays Prawns Miscellaneous Cat fish	Indian Salmon Jew fish Cock-up Miscellaneous	Indian Salmon Cock-up Jew fish Cat fish	Indian Salmon Jew fish Cat fish Miscellaneous	Mullets Prawns Jew fish Cock-up
Do.	11	Muthupet	Cat fish Mullets Prawns Indian Salmon	Mullets Prawns Cat fish Skates and Rays Indian Salmon	Anodontesoma Cook up Mullets Indian Salmon Prawns	Indian Salmon Mullets Cock-up Oat fish Prawns	Mullets Prawns Oat fish Cock-up Jew fish
Do.	12	Adiram-pattam	Sharks and Rays Cat fish Jew fish Pomfret Seer Prawns	Skates and Rays Sabre fish Jew fish Seer Indian Salmon Cock-up Pomfret	Sharks and Rays Cat fish Sabre fish Jew fish Pomfret Seer Prawns	Sharks and Rays Jew fish Indian Salmon Oat fish Pomfret Seer Prawns	Oat fish Jew fish Prawns Indian Salmon Sabre fish Cock-up Seer
Tanjavor	13	Sethubava-ohatram	Mullets Rock Cod Jew fish Indian Salmon Cock-up Crabs	Mullets Seer Jew fish Rock Cod Cock-up Crabs	Mullets Seer Crabs Cock up Rock Cod	Crabs Sharks and Rays Sabre fish Jew fish Rock Cod'	Sharks and Rays Cock-up Rock Cod Jew fish Mullets Crabs

No.	District.	Name of fishing centre.	July.	August.	September.	October.	November.	December.
Tanjavoor	14	Ammapatnam	Sharks and Rays Seer Crabs Prawns Pomfret Sardines	Sabre fish Sharks and Rays Seer Mullet Pomfret	Prawns Sharks and Rays Sardines Beer Crabs	Jew fish Cat fish Sharks and Rays Prawns Sardines Pomfret	Jew fish Cat fish Sharks and Rays Prawns Sardines Pomfret	Sharks and Rays Cat fish Sardines Seer Crabs Prawns
Ramanathapuram	15	Nambithalai	Sharks and Rays Horse Mackerel Pallona. Silver Bellies Ribbon fish	Sharks and Rays Horse Mackerel Silver bellies Cat fish	Jew fish Sharks and Rays Miscellaneous Beer	Horse Mackerel Sharks and Rays Miscellaneous Crabs	Horse Mackerel Sharks and Rays Silver bellies Indian Salmon	Horse Mackerel Hilsa Miscellaneous Seer Cat fish
Do.	16	Pamban, Rameswaram Islands and Dhanushkodi	Sharks Skates and Rays Seer Sabro fish Sardines Cat fish	Sardines Sharks Seer fish Sabre fish	Sardines Seer Skates and Rays Seer fish Sabre fish	Sardines Sharks Skates and Rays Seer fish Sabre fish	Sardines Sharks and Rays Seer Skates and Rays Seer Sabre fish	Sharks Sardines Sabre fish Seer fish
Do.	17	Attankarai	Sardines Sharks and Rays Seer White bait	Sardines Seer Sharks White bait	Sardines Seer Sharks and Rays Miscellaneous	Beer Sardines Crabs Skates and Rays Eels Silver bellies	Cat fish Sardines Seer Skates and Rays Eels	Cat fish Dussumeria Pointret Miscellaneous
Do.	18	Mukkur	Jew fish Mullet Beer Sardines Miscellaneous	Miscellaneous Crabs Sardines Mulletts	Miscellaneous Sardines	Sardines Prawns Silver bellies Lactarius	Dussumeria Mackerel Silver bellies Seer Lactarius	Dussumeria Silver bellies Lactarius Seer Cat fish

Trinavelli	19	Sippikulam	Dusuneria Jew fish Skates and Rays Sabre fish	Dusuneria Miscellaneous Sabre fish	Lathrinus Perches Sabre fish Sardines Seer Horse Mackerel	Sardines Silver bellies Miscellaneous Seer	Dusuneria Silver bellies Jew fish Horse Mackerel	Bardines Dusuneria Perches Lutjanus Sabre fish Horse Mackerel Seer	Sardines Engraulis Perches Lutjanus Sabre fish Horse Mackerel Seer	Bardines Dusuneria Perches Lutjanus Sabre fish Horse Mackerel Seer	Sardines Perches Lethrinus Lutjanus Sabre fish Horse Mackerel Seer	Dusuneria Silver bellies Jew fish Horse Mackerel	Sardines Perches Lethrinus Lutjanus Sabre fish Horse Mackerel Seer
Do.	20	Tuticorin	Sabre fish Perches Sardines Lethrinus Seer Horse Mackerel	Sabre fish Perches Sardines Lethrinus Seer Horse Mackerel	Lathrinus Perches Sabre fish Sardines Seer Horse Mackerel	Sardines Perches Lethrinus Lutjanus Seer Horse Mackerel	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish
Do.	21	Pinnak-kayal	Sardines Miscellaneous Dusuneria Sabre fish	Sardines Engranilis Dusuneria Sharks and Rays	Sardines Engranilis Dusuneria Sharks and Rays	Sardines Dusuneria Sharks and Rays Miscellaneous	Sardines Dusuneria Sharks and Rays Miscellaneous	Sardines Dusuneria Sharks and Rays Miscellaneous	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish	Sardines Dusuneria Sharks and Rays Miscellaneous Sabre fish
Do.	22	Periyathalai	Sharks and Rays Miscellaneous Oat fish Jew fish Horse Mackerel Sabre fish	Sharks and Rays Baby fish Oat fish Jew fish Miscellaneous	Sabre fish Baby fish Oat fish Jew fish Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous	Sabre fish Sardines Jew fish Seer Miscellaneous
Do.	23	Ovari	Jew fish Cat fish Sabre fish Horse Mackerel	Jew fish Cat fish Sabre fish Horse Mackerel	Sabre fish Oat fish Jew fish Laetarius	Sardines Sabre fish Jew fish Horse Mackerel	Sardines Sabre fish Jew fish Horse Mackerel	Sardines Sabre fish Jew fish Horse Mackerel	Sabre fish Sardines Jew fish Laotarius	Sabre fish Sardines Jew fish Laotarius	Sabre fish Sardines Jew fish Laotarius	Sabre fish Sardines Jew fish Laotarius	Sabre fish Sardines Jew fish Laotarius
Do.	24	Idinthai-kai	Sabre fish Cat fish Jew fish Miscellaneous	Sabre fish Cat fish Jew fish Miscellaneous	Sabre fish Oat fish Jew fish Laotarius	Sardines Laotarius White bait Oat fish	Sardines Laotarius White bait Oat fish	Sardines Laotarius White bait Oat fish	Sabre fish Oat fish Jew fish Laotarius	Sabre fish Oat fish Jew fish Laotarius	Sabre fish Oat fish Jew fish Laotarius	Sabre fish Oat fish Jew fish Laotarius	Sabre fish Oat fish Jew fish Laotarius

No.	District.	Name of fishing centre.	July.	August.	September.	October.	November.	December.
Tirunelveli	25	Koothupulli	Sabre fish Sardines White bait Jew fish	Sabre fish Sardines Lactarius Jew fish	Lactarius Cat fish White bait Sardines Beer	Lactarius Sabre fish White bait Sardines Beer	Sabre fish Lactarius White bait Dussumeria	Cat fish Miscellaneous Sabre fish
Kanya-kumari	26	Cape Comorin	Ribbon fish Sabre fish Cat fish Horse Mackarel Shark Prawns	Ribbon fish Sabre fish Oat fish Shark	White bait Ribbon fish Beer Lactarius Sabre fish Shark	White bait Ribbon fish Beer Lactarius Sabre fish Shark	White bait Ribbon fish Beer Lactarius Sabre fish Shark	White bait Beer Dussumeria Shark Lobster Porches
Do.	27	Muttom	Ribbon fish Sabre fish Horse Mackarel Cat fish Shark Prawns	Ribbon fish Lactarius Sabre fish Shark Oat fish	White bait Lactarius Sabre fish Beer	White bait Lactarius Ribbon fish Beer Sabre fish	White bait Lactarius Ribbon fish Beer Sabre fish	Shark White bait Beer Dussumeria Lobster Porches
Do.	28	Kadipattam	Sabre fish Ribbon fish Cat fish Horse Mackarel Prawns Shark	Lactarius Ribbon fish Sabre fish Oat fish Shark	Ribbon fish White bait Sabre fish Lactarius Beer Shark	Ribbon fish White bait Sabre fish Lactarius Beer Shark	White bait Lobster Silver bellies Beer Lactarius	Shark White bait Beer Dussumeria Lobster Porches
Do.	29	Colachel	Ribbon fish Sabre fish Shark Cat fish Horse Mackarel Prawns	Sabre fish Ribbon fish Lactarius Oat fish Shark	White bait Ribbon fish Beer Sabre fish Lactarius	White bait Ribbon fish Beer Sabre fish Lactarius	White bait Shark Beer Lobster Silver bellies Lactarius	White bait Shark Beer Lobster Dussumeria Porches

Kanya-kumari.	30	Enyam-puthenthura	Sabre fish	Ribbon fish	Sabre fish	White bait
			Horse Mackerel	Sabre fish	White bait	Seer
			Ribbon fish	Lactarius	Sabre fish	Shark
			Cat fish	Cat fish	Ribbon fish	Lobster
			Shark	Shark	Seer	Dussumeria
			Pravus	Lactarius	Lactarius	
Do.	31	Thuttor	Sabre fish	Ribbon fish	White bait	White bait
			Ribbon fish	Sabre fish	Sabre fish	Dussumeria
			Cat fish	Oat fish	Ribbon fish	Seer
			Horse Mackerel	Lactarius	Lactarius	Lobster
			Prawns	Shark	Seer	Shark
			Shark			Silver bellies

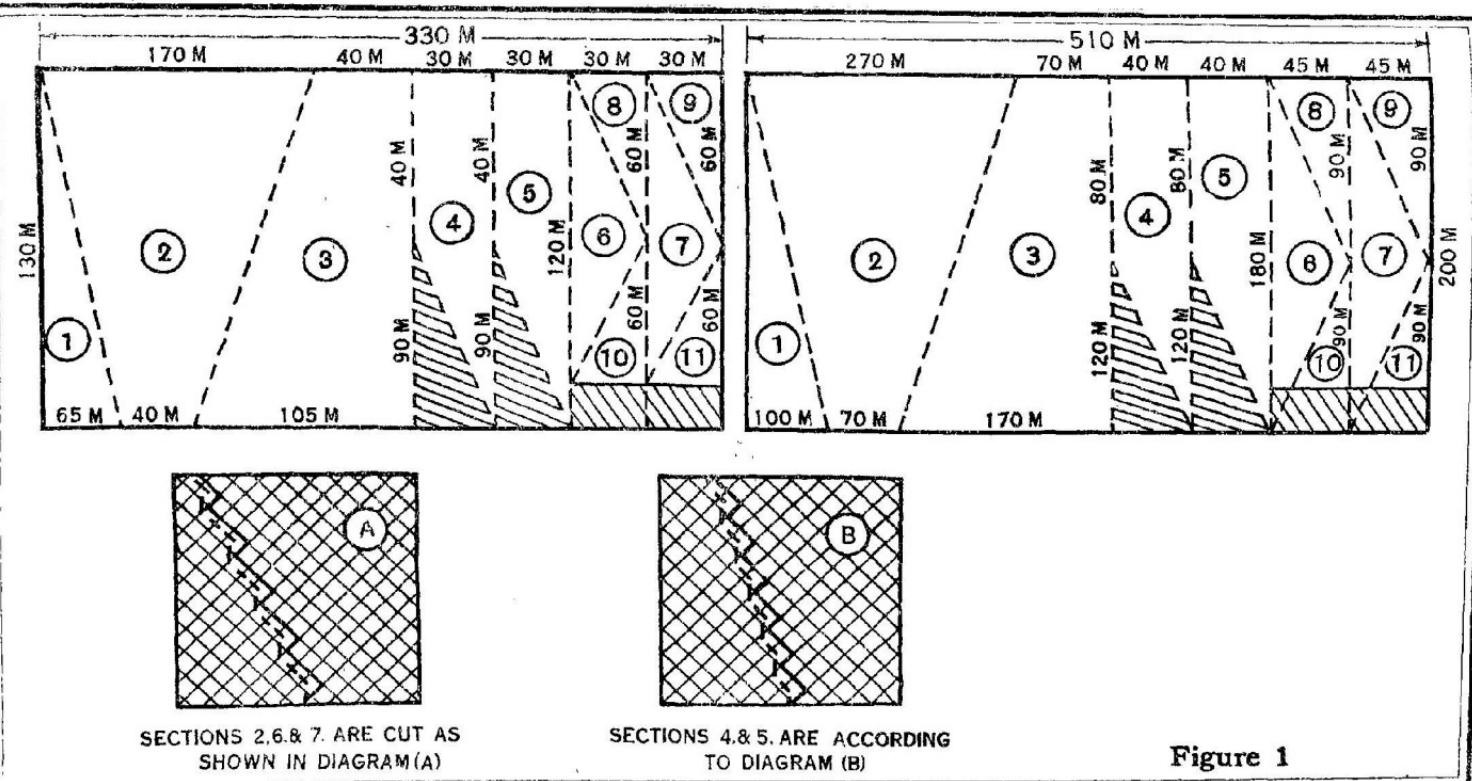
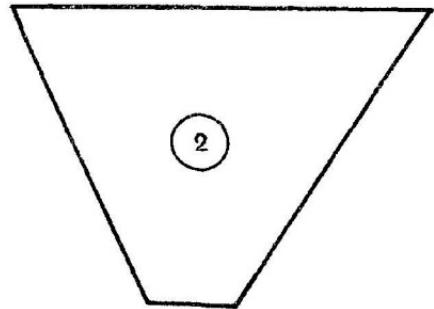
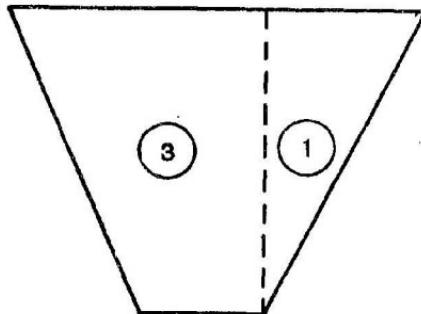


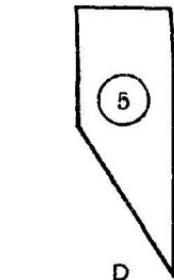
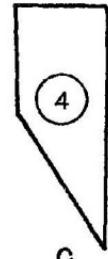
Figure 1



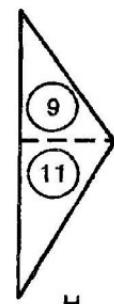
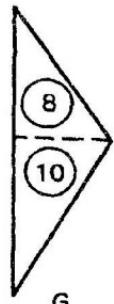
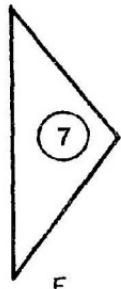
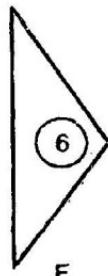
A
TOP BELLY



B
LOWER BELLY



BELLY WEDGES PLUS WINGS

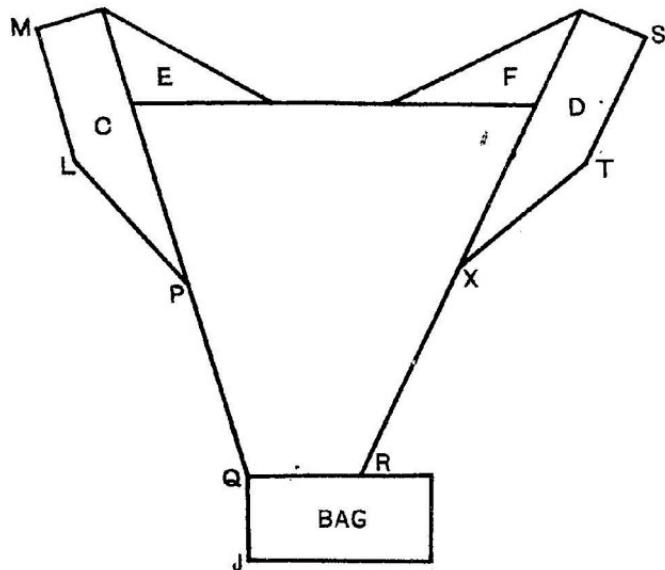


F
WING COVERING PIECES



Figure 2

TOP SECTION WITH BAG



BOTTOM SECTION

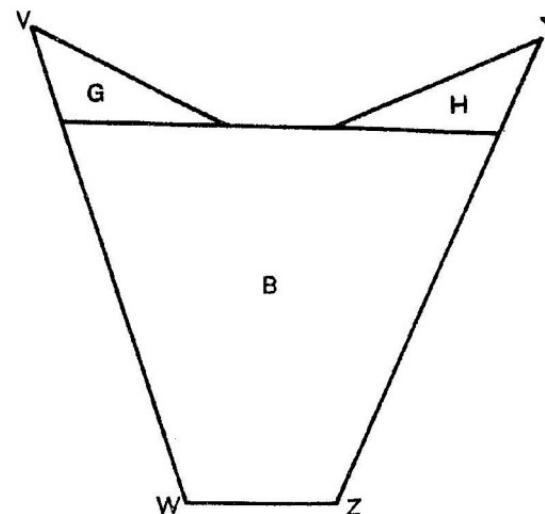


Figure 3

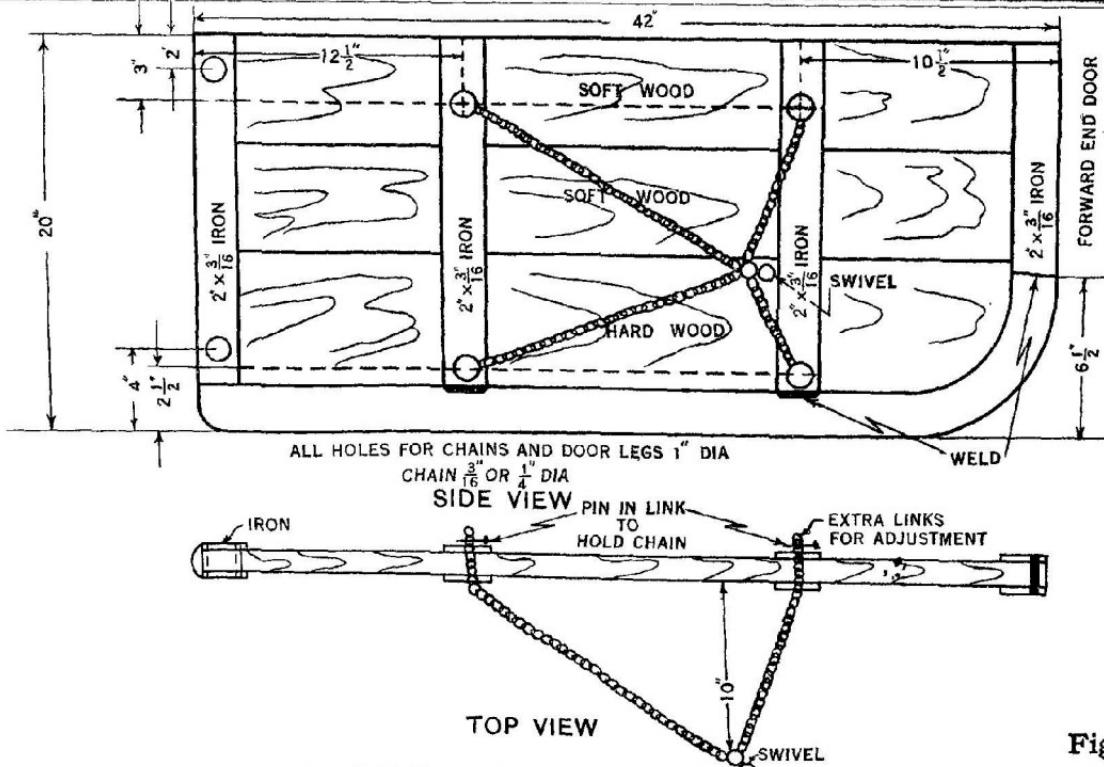


Figure 4

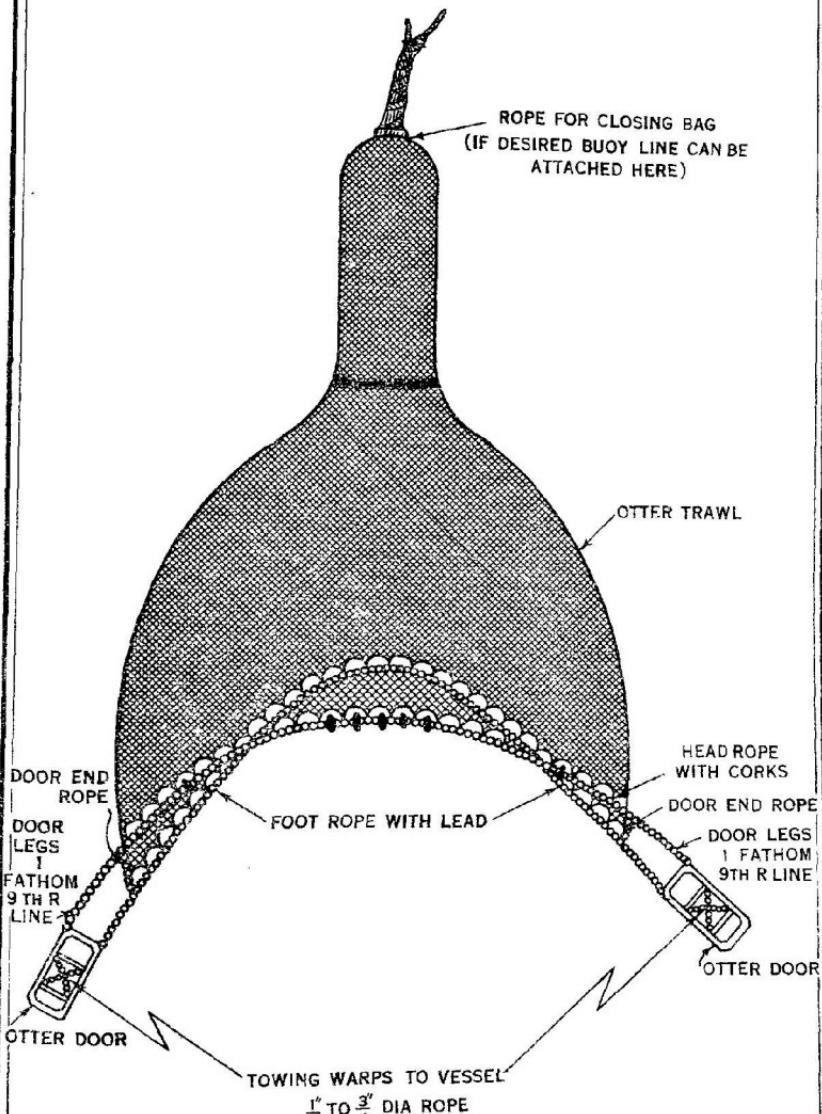


Figure 5

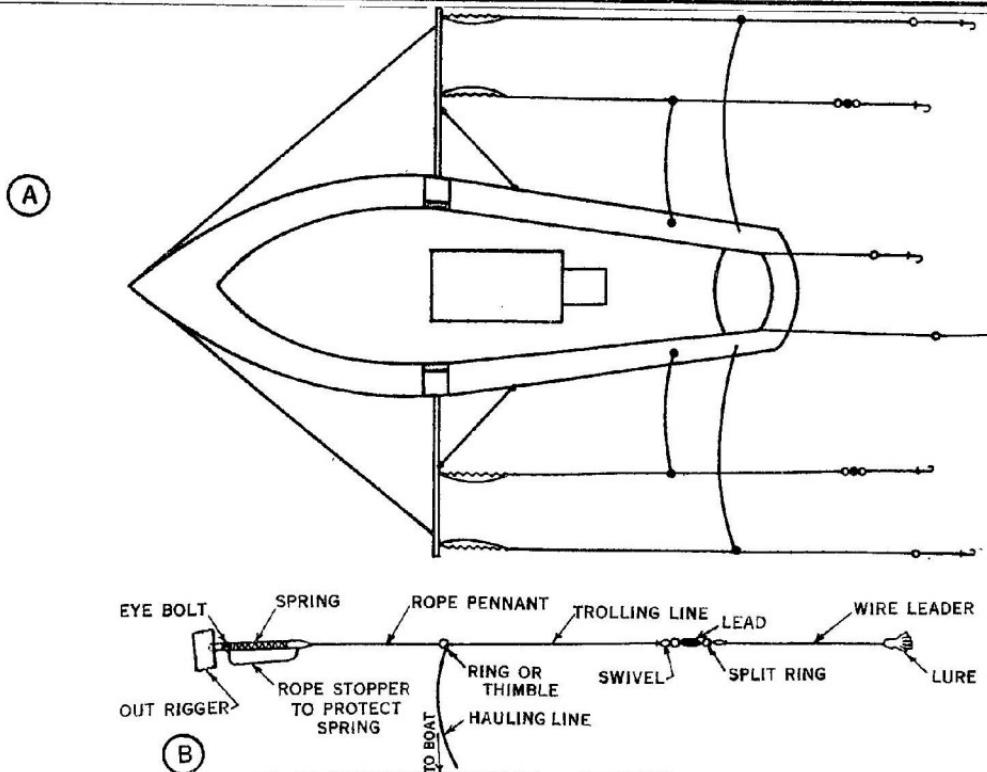


Figure 6

Reg. No. 421 E '59 (Saka Era 1881) 500

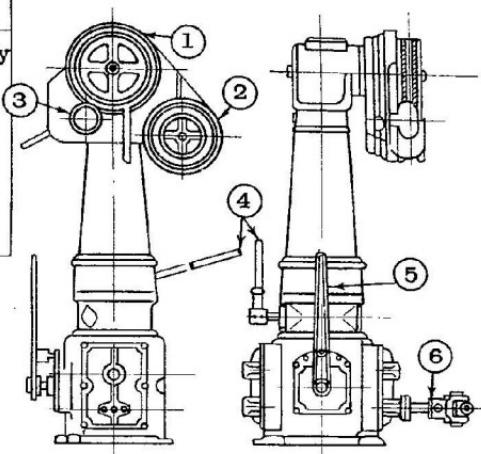
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THE LINE HAULER FOR THE LONG LINE

(I) DRAWING

REMARKS OF LINE HAULER	
1	Rope winding pulley
2	Rope drive pulley
3	Rope push roller
4	Stop handle
5	Clutch handle
6	Driving shaft



(II) THE MAIN DATA OF THE HAULER

MODEL	HEIGHT <i>m/m</i>	WEIGHT <i>Kgs.</i>	R.P.M. OF SHAFT	WINDING SPEED <i>m/m</i>	MAX. R.P.M. OF SHAFT	SIZE OF BOAT
Special size	1,480	356	220	H. Speed 184 L. Speed 161	300	Over 100 ton
Large size (Standard)	1,380	280	200	H. Speed 144 L. Speed 96	300	Over 30 ton
Large size (Lower)	1,240	260	200	H. Speed 144 L. Speed 96	300	Over 20 ton

(III) THE ACCESSORIES OF THE HAULER

The three roller fairleader One p'ce

The universal joint One p'ce

THE SPARE OF THE PART OF THE
HAULER

The rubber sheave 20 P'ces

(IV) REMARKS

As to how to install the Hauler
on the deck and the operator's
manual Please refer to the
attached Sheet

THE NIPPON GYOMO SENGU K. LTD.

Room 652-5, Marunouchi Building

Chiyodaku Tokyo Japan

(Maker: Izai Iron work Co., Ltd.)

Figure 7

BOTTOM SET GILL NETS

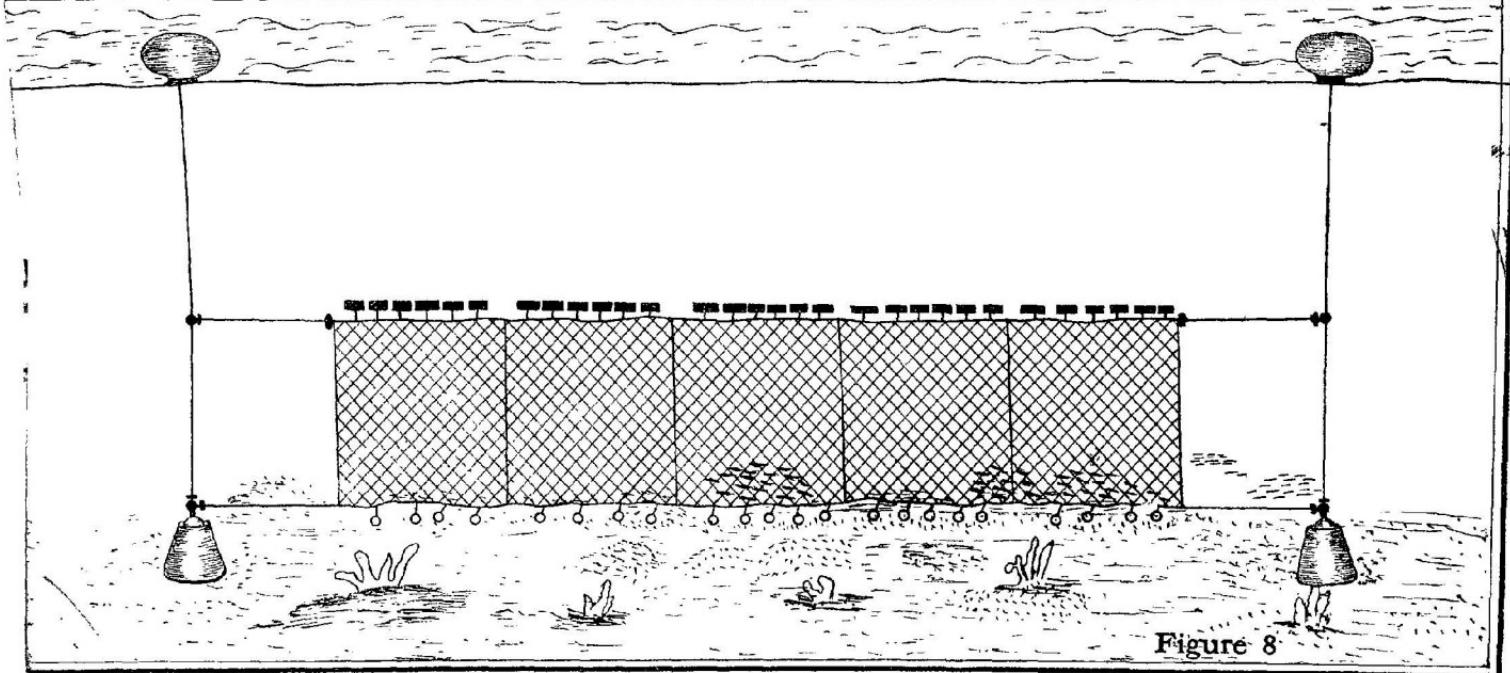


Figure 8

DRIFT NET

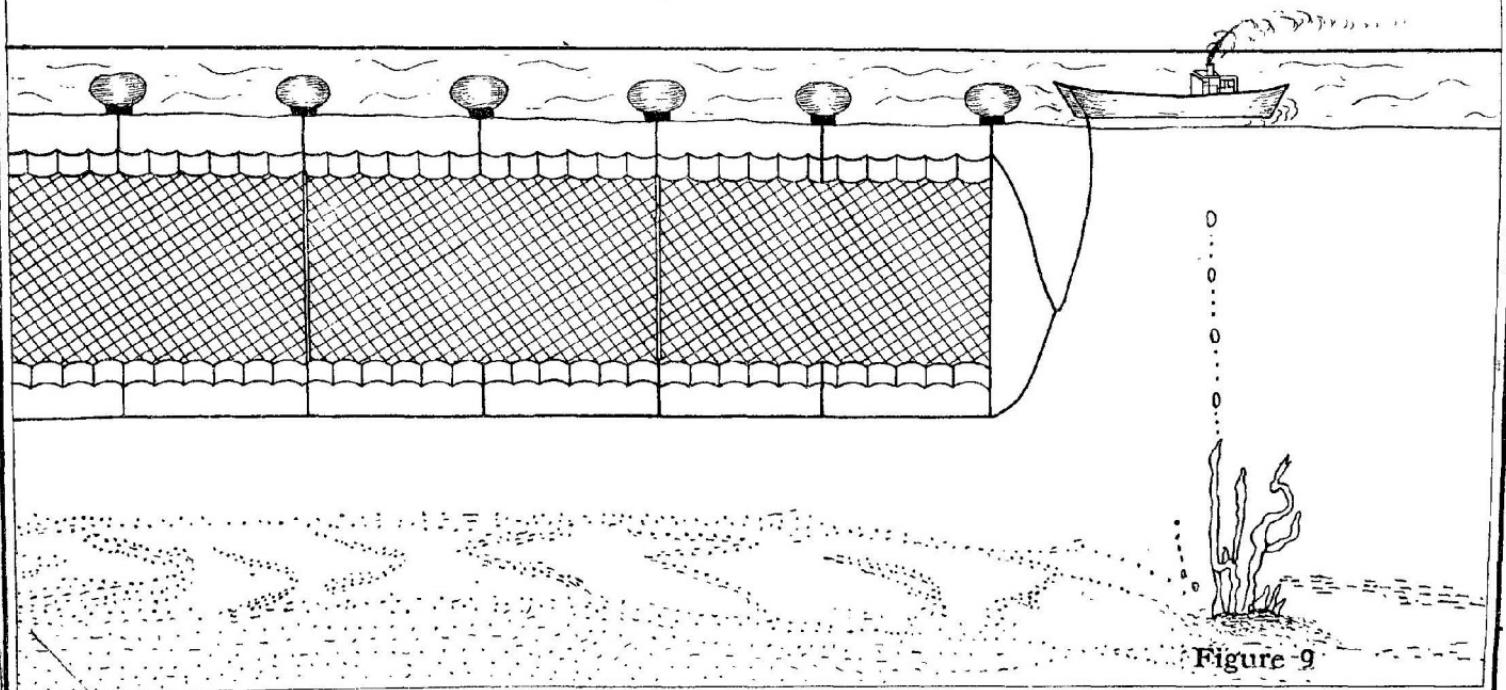


Figure 9

Reg. No. 424 E '59 (Saka Era 1881) 500

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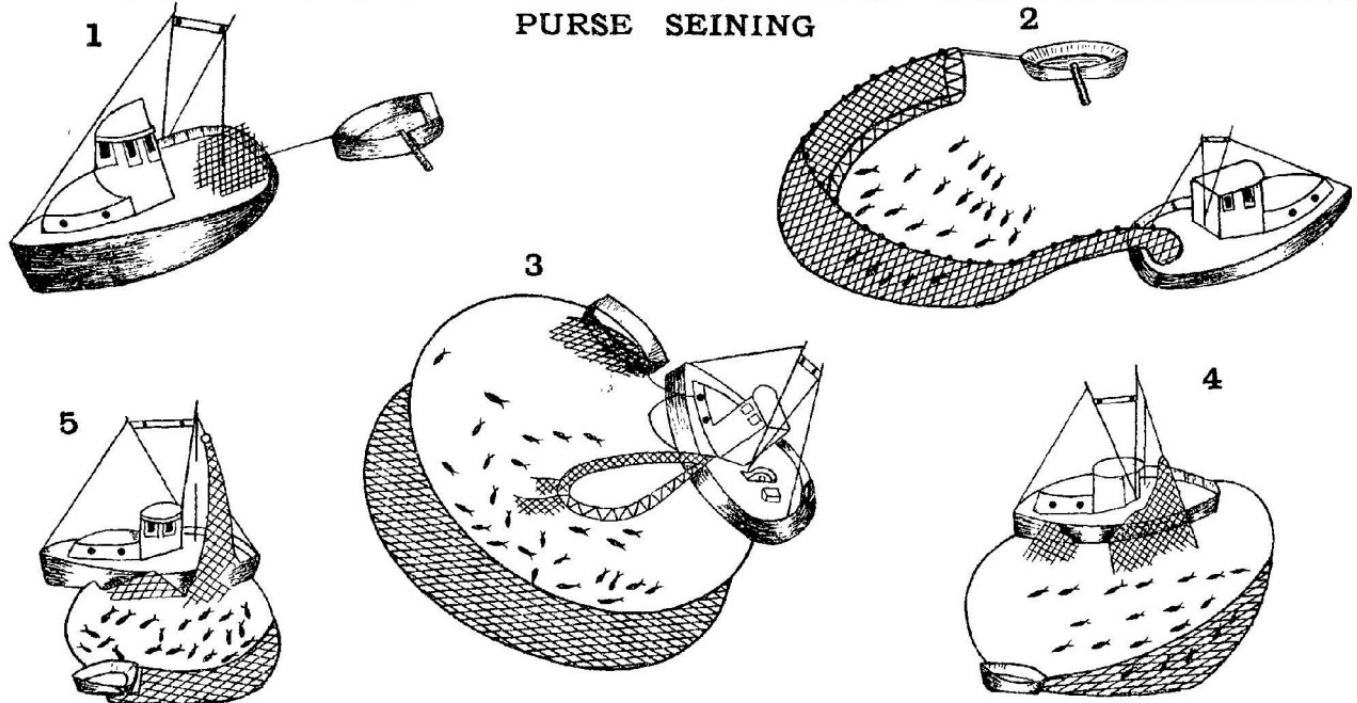
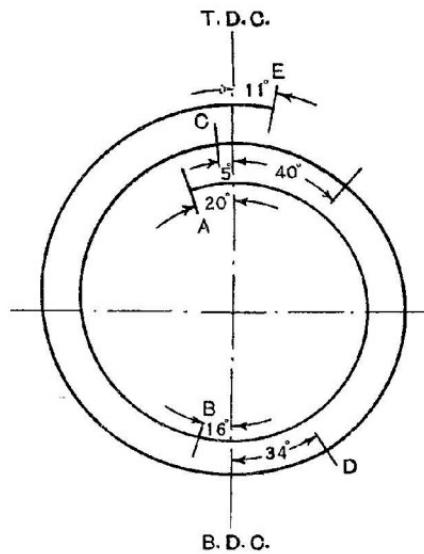
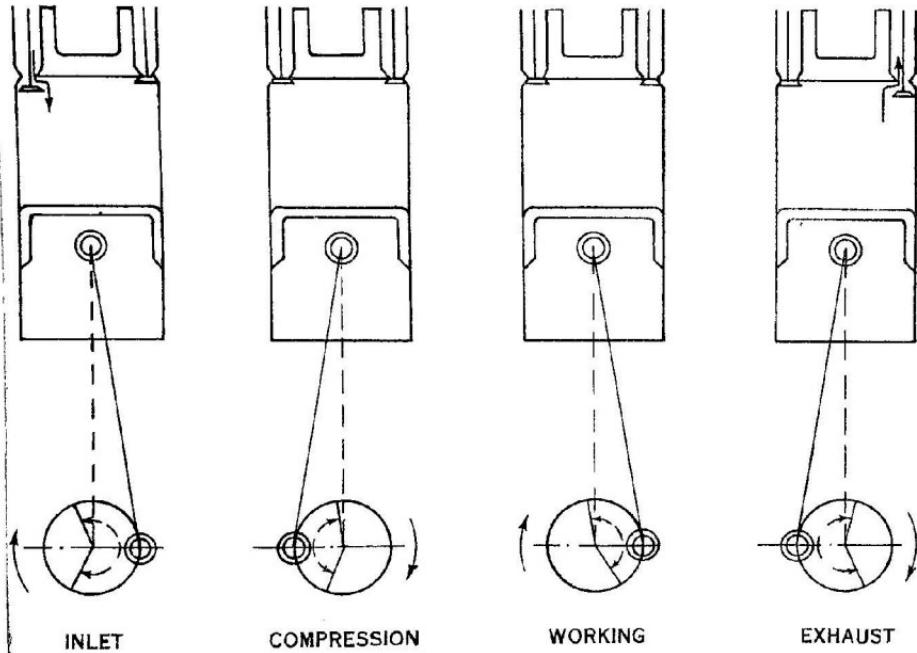


Figure 10

Reg. No. 425 E '59 (Saka Era 1881) 500

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- A AIR INLET OPENS
- B AIR INLET CLOSES
- C INJECTION
- D EXHAUST OPENS
- E EXHAUST CLOSES

Figure 11

No.426 E '59 (Saka Era 1881) 500

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